MPA STUTTGART
Otto-Graf-Institut
Materialprüfungsanstalt Universität Stuttgart

EU Hardwoods Project Meeting
June 2nd–3rd 2016

FEM simulation of glulam beams with stochastic material properties

Cristóbal Tapia Camú

FEM model

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- Simplification of the model (BC)

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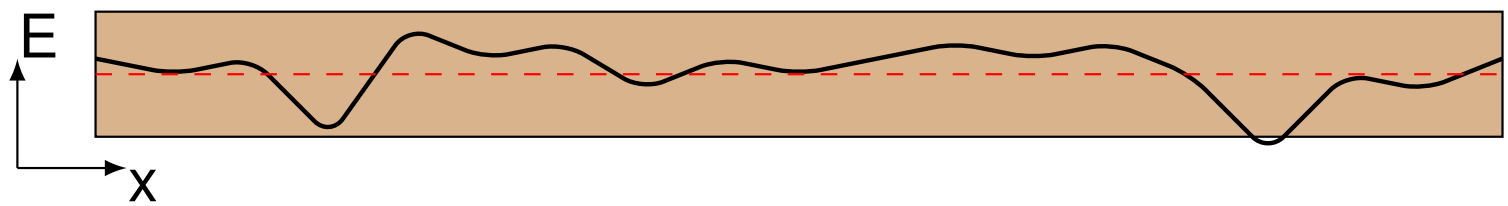
Auto-correlation of properties within single boards



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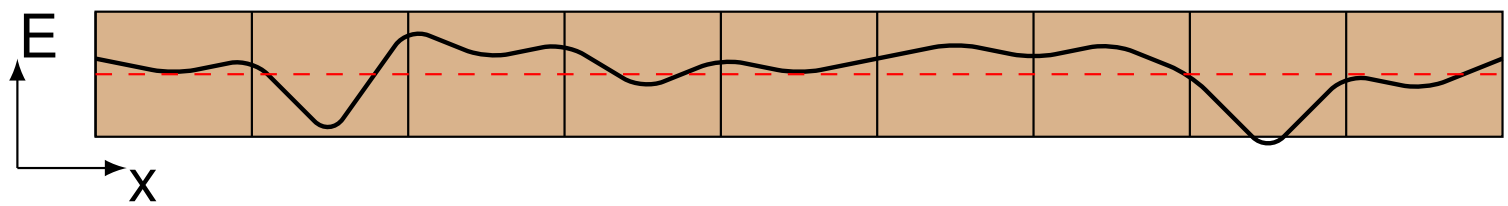

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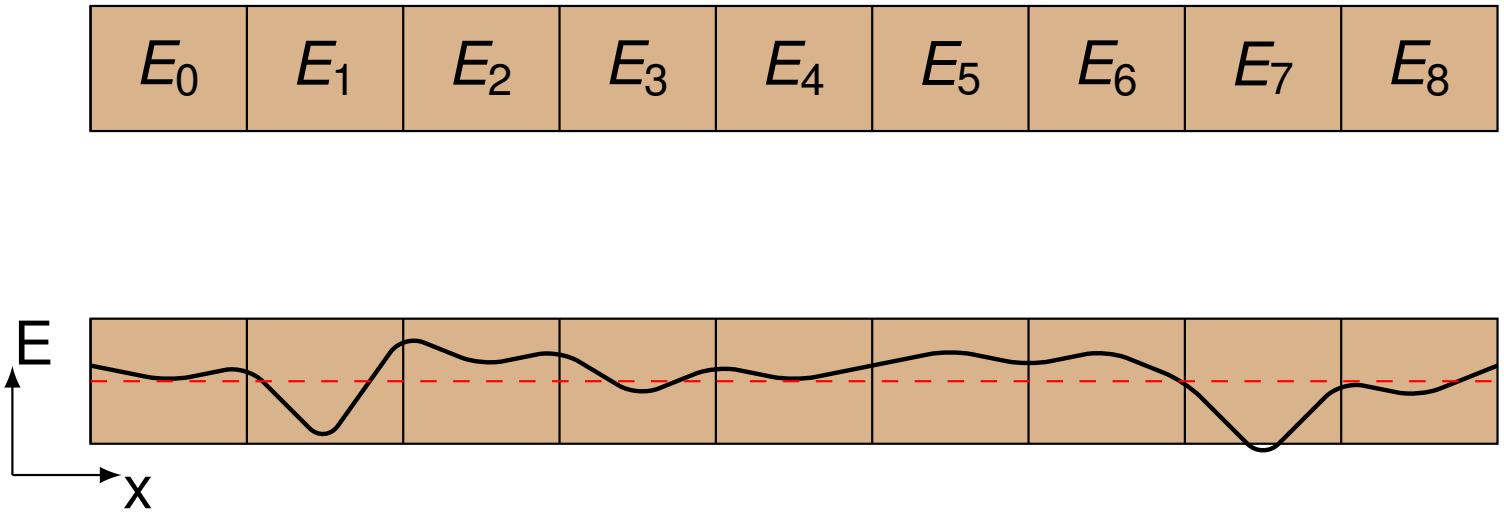

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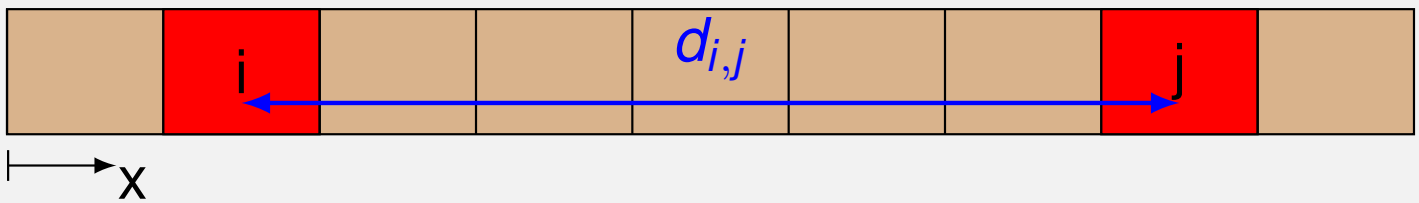

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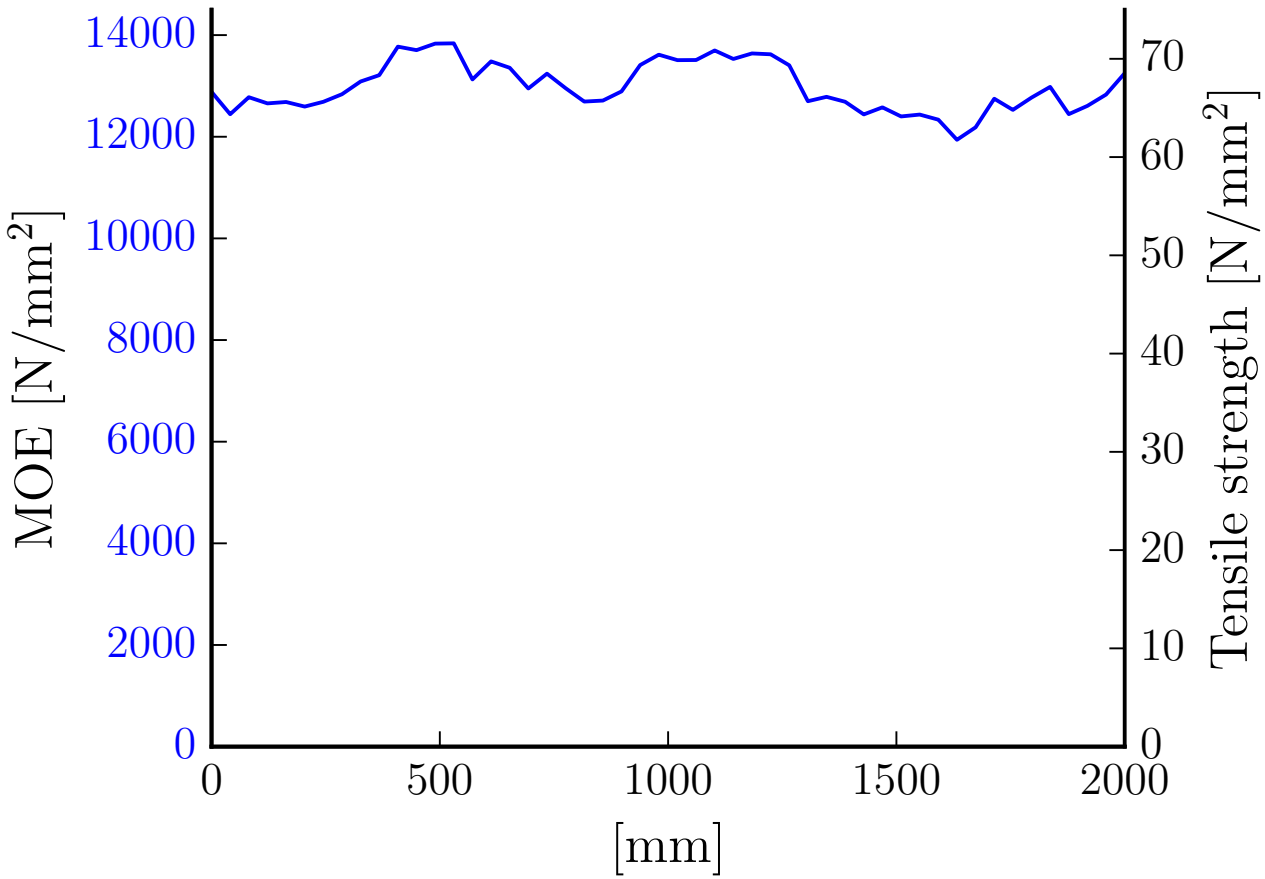

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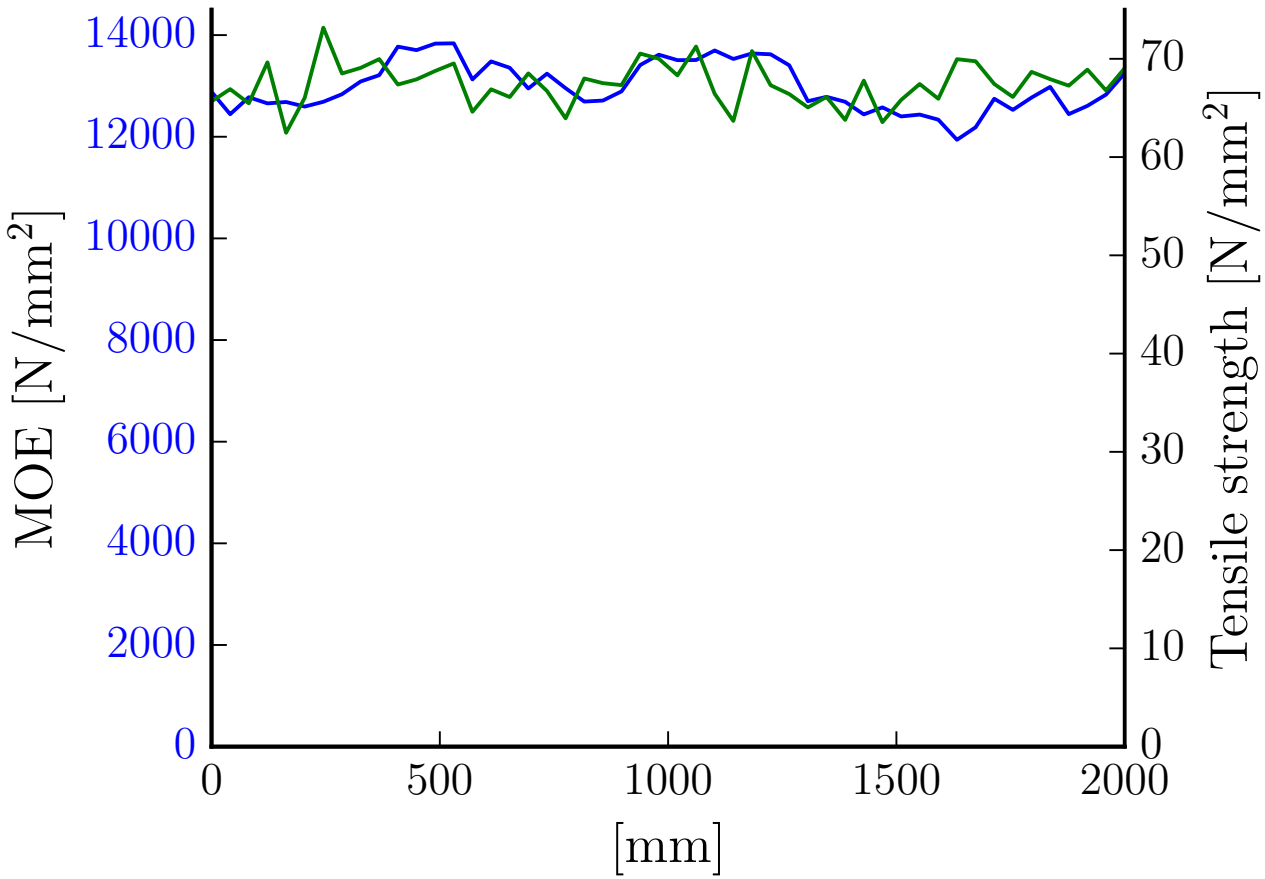

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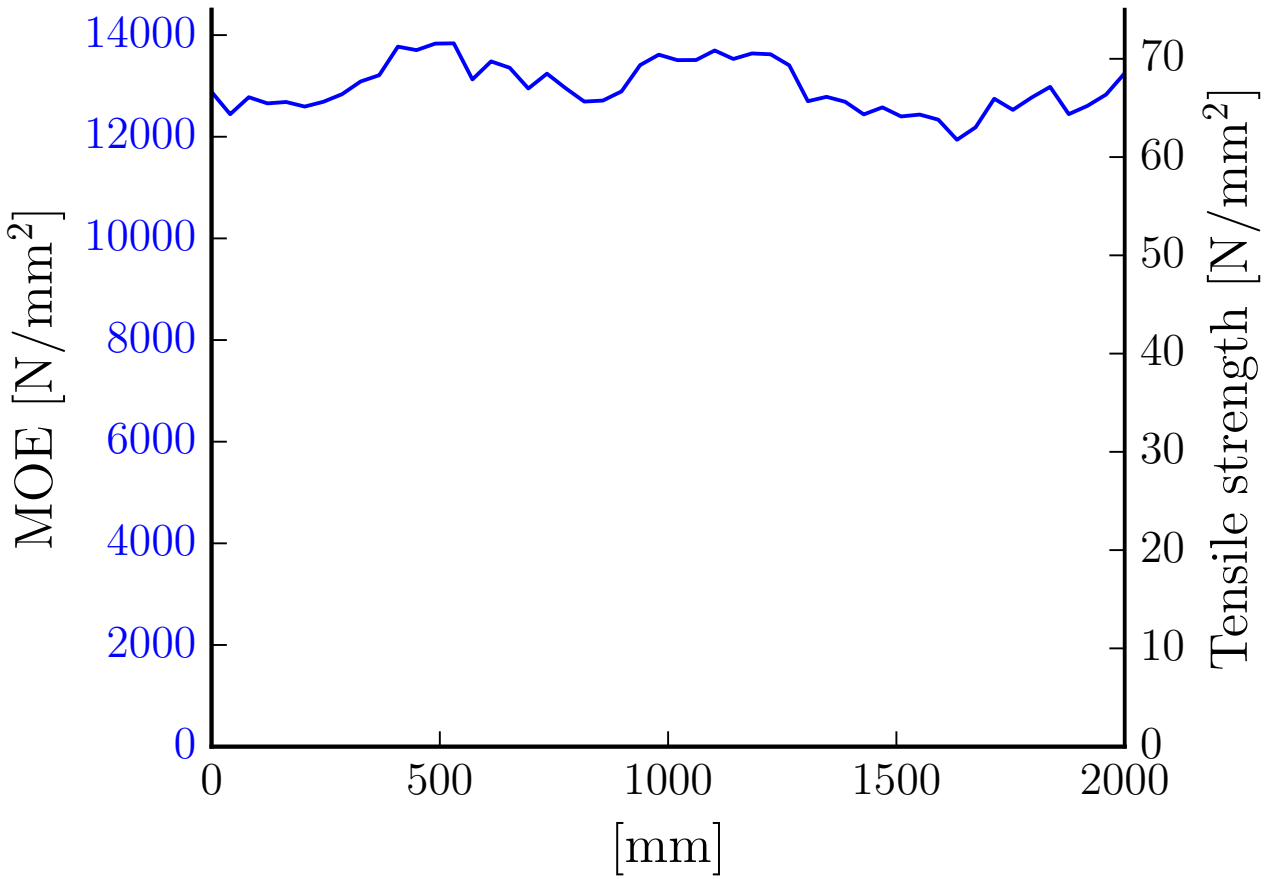

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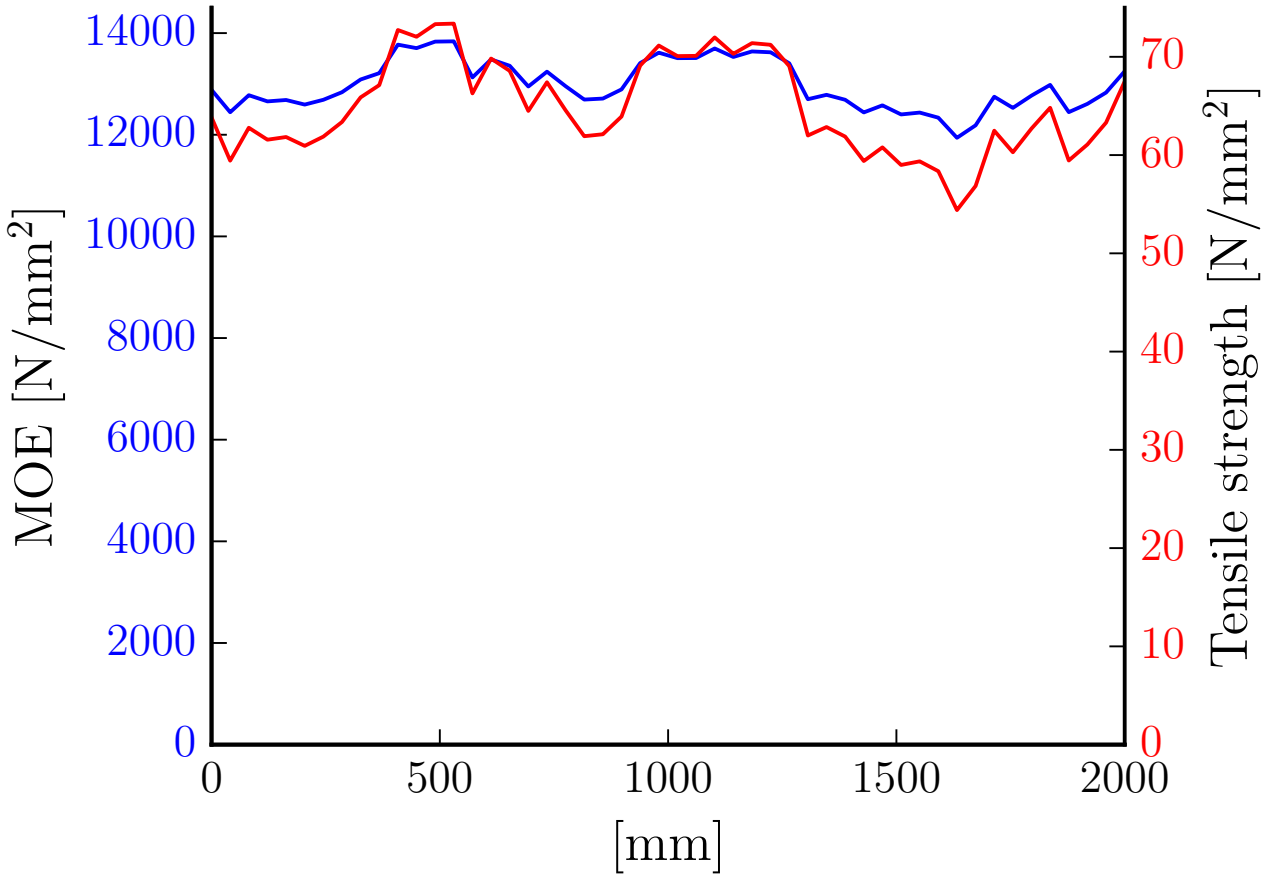

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Laminations and finger joints

The generation of lamellae was improved:

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3. A single, very long lamella is created this way, which then is "cut" (until this point everything is just data)

Generation of input data

N=1

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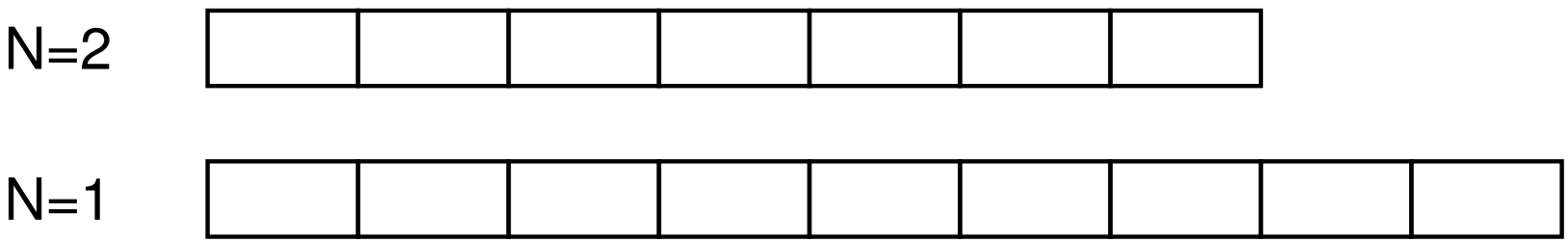

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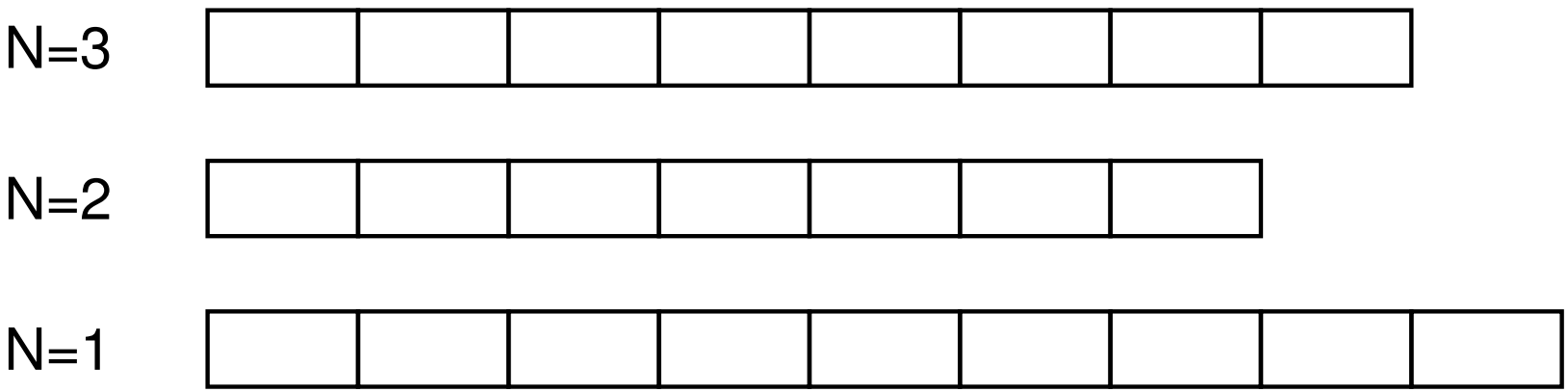

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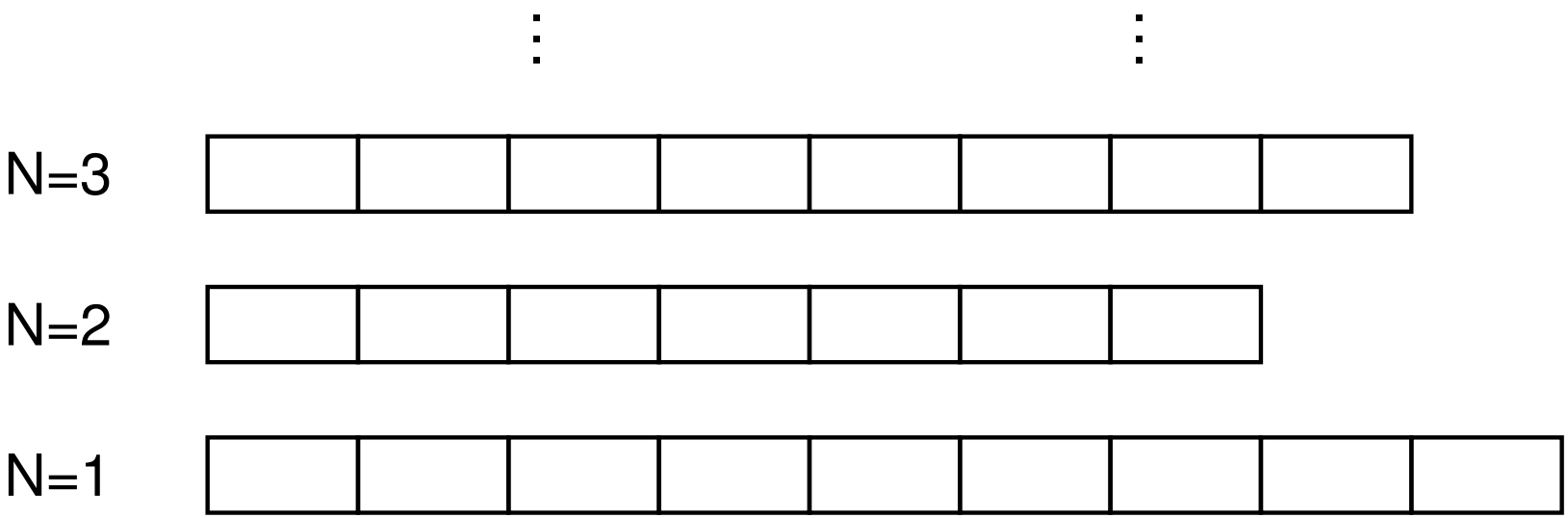

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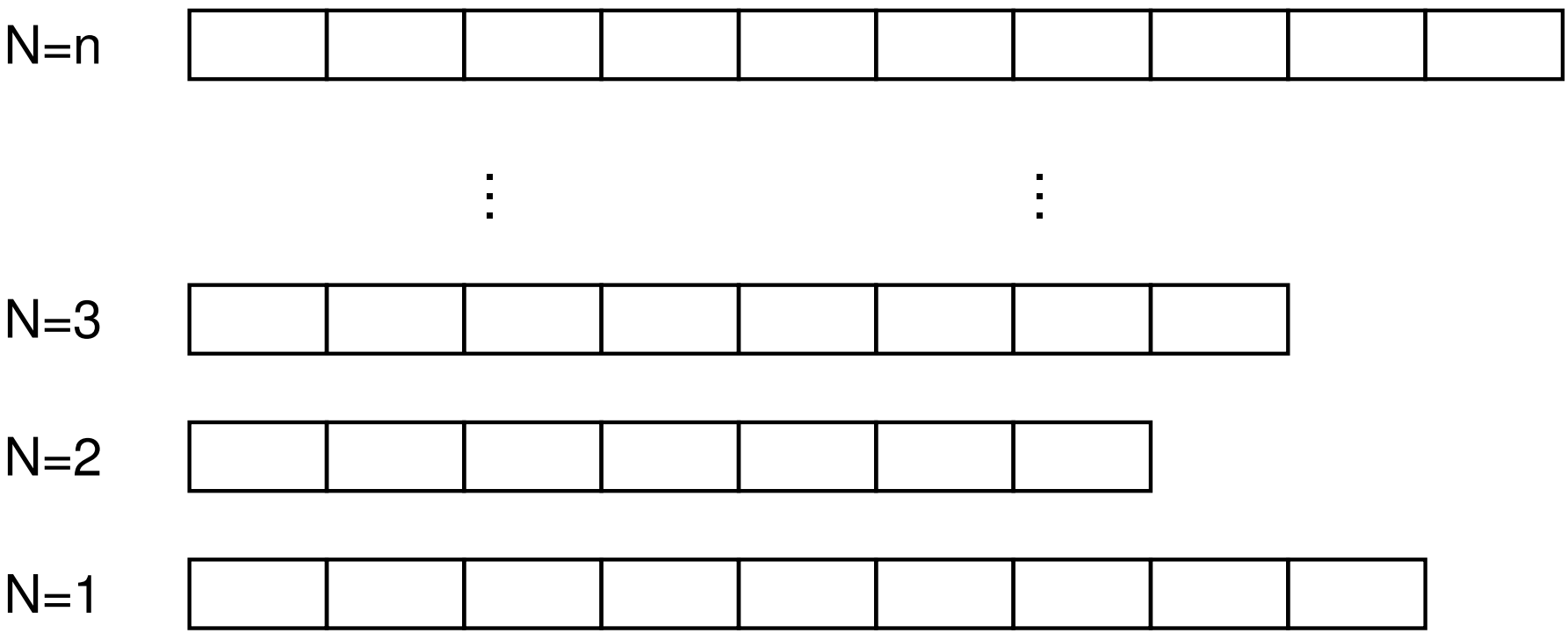

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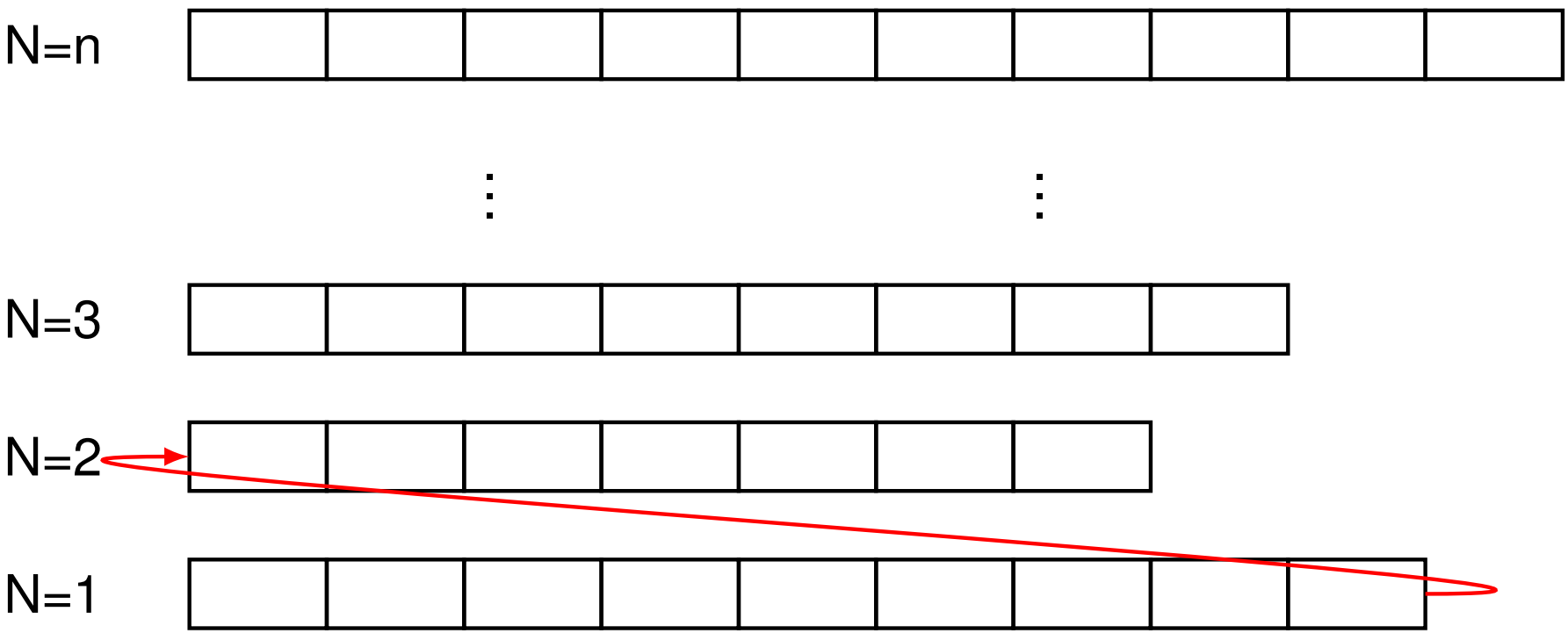

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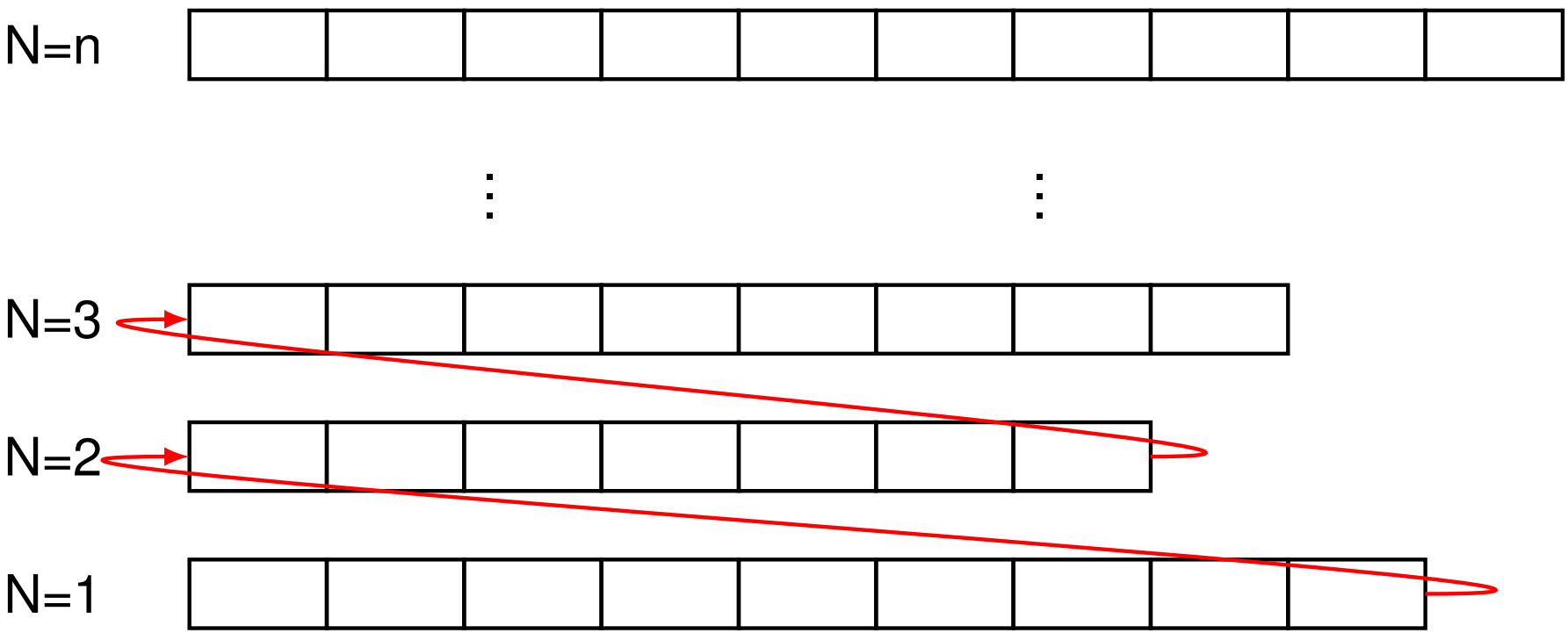

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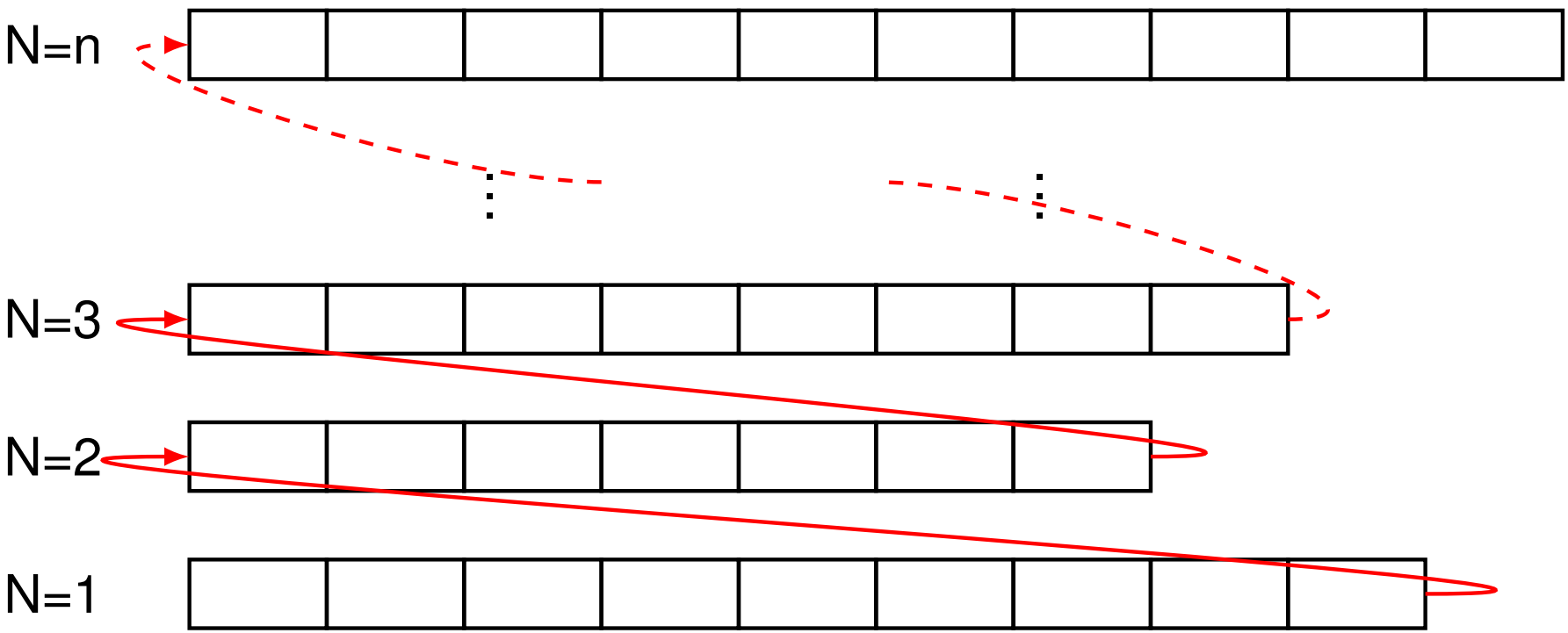

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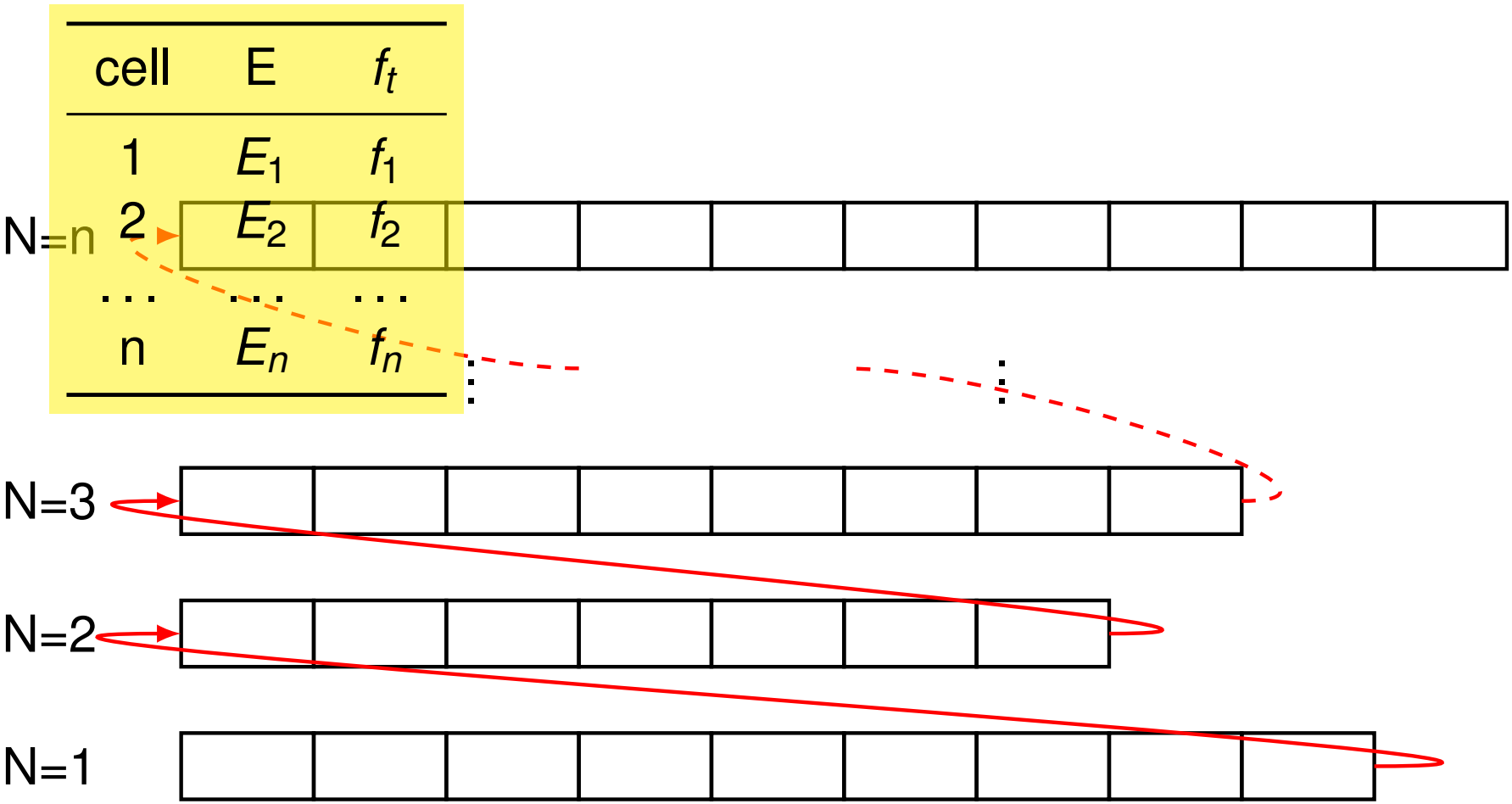

Building the glulam

The process to build the glulam model contemplates

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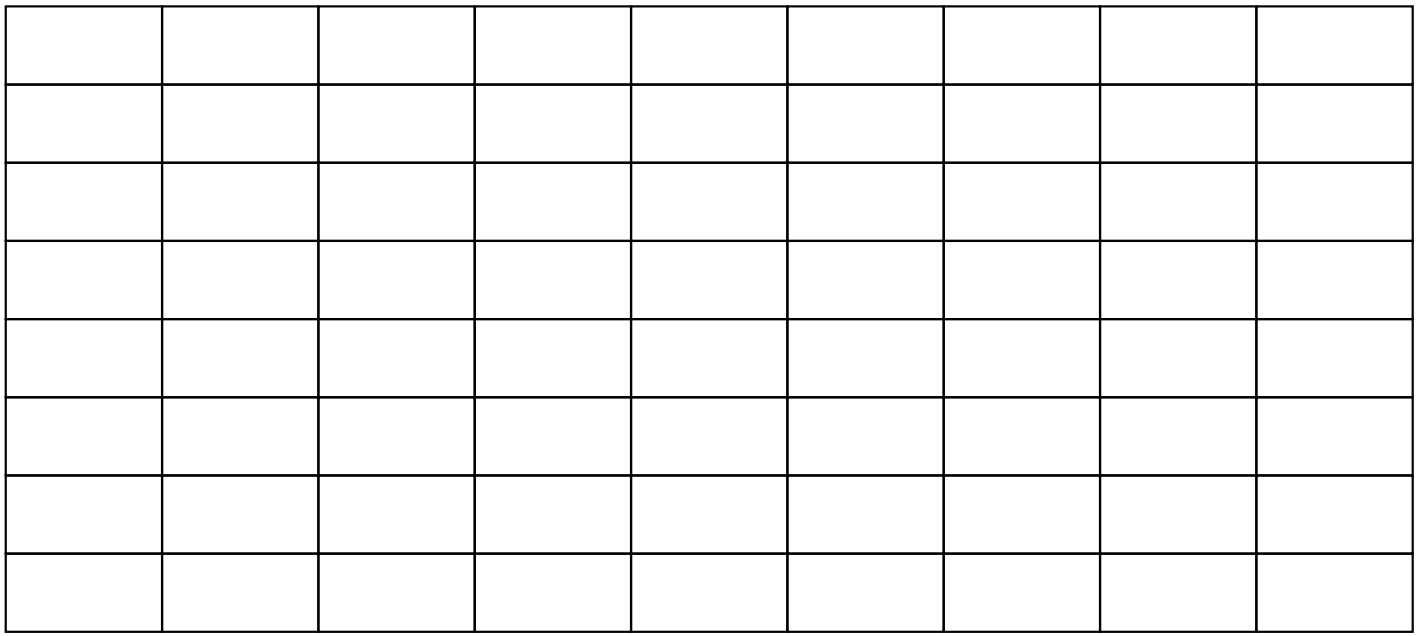
Procedure



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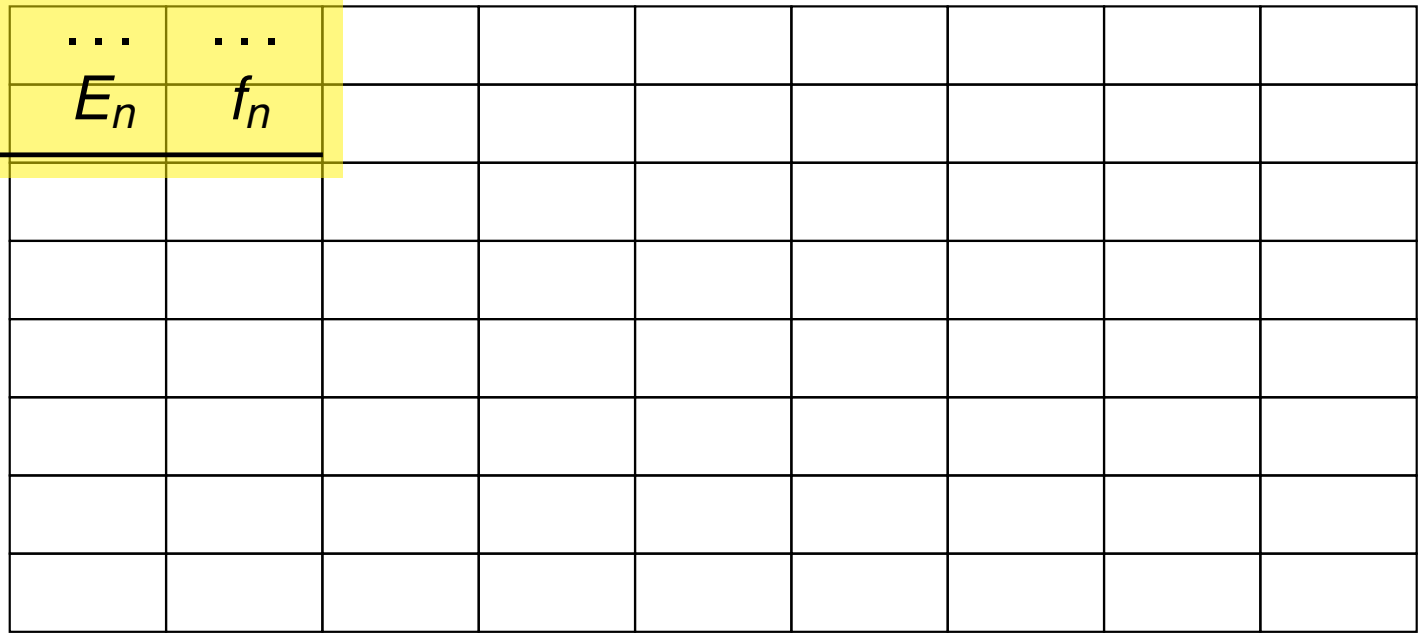

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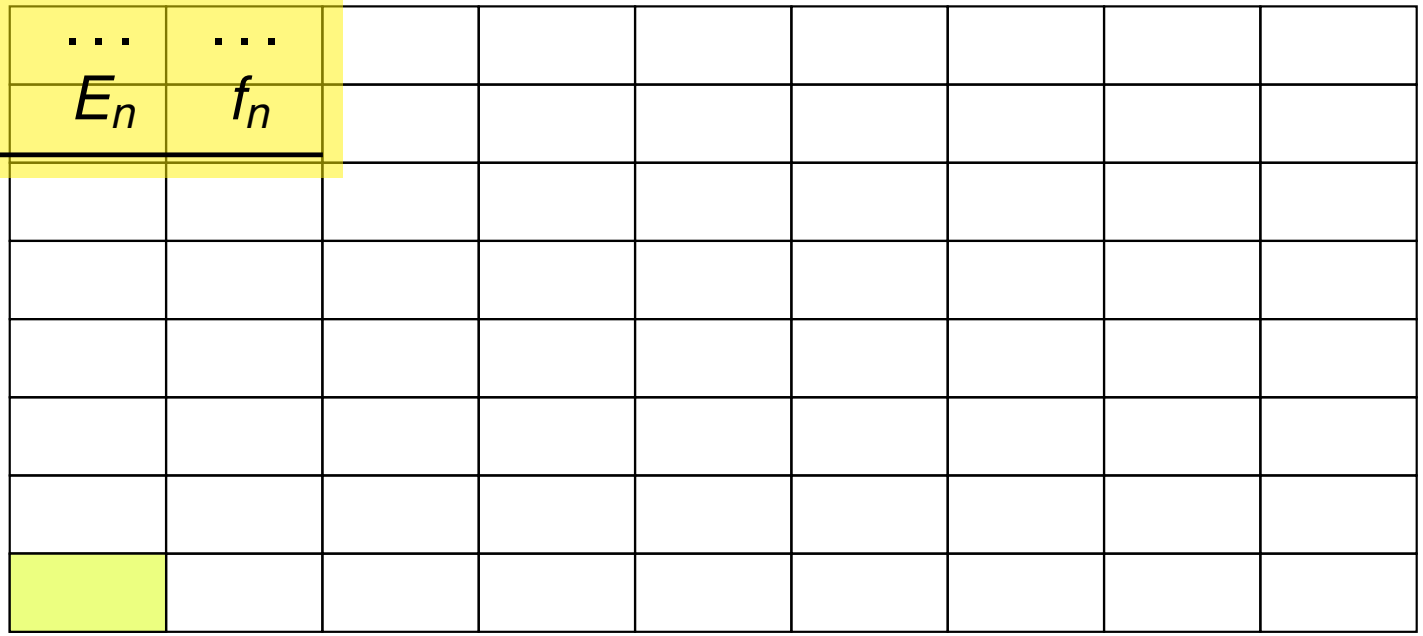

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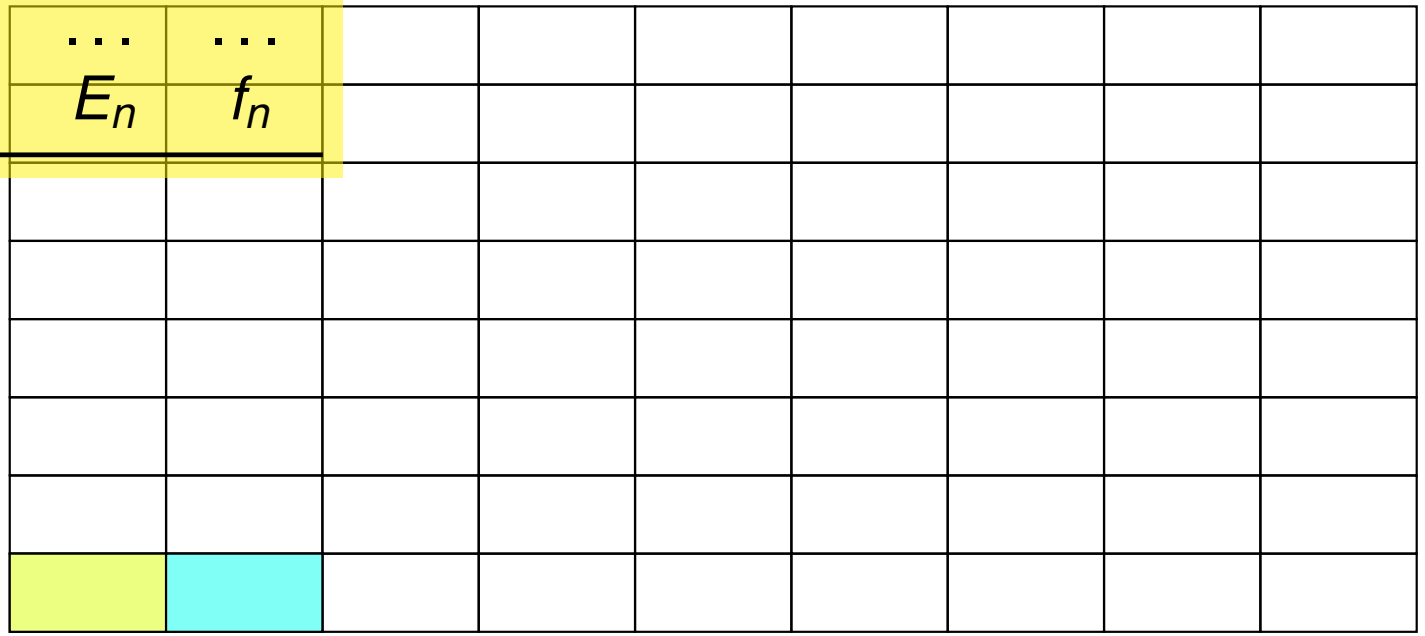

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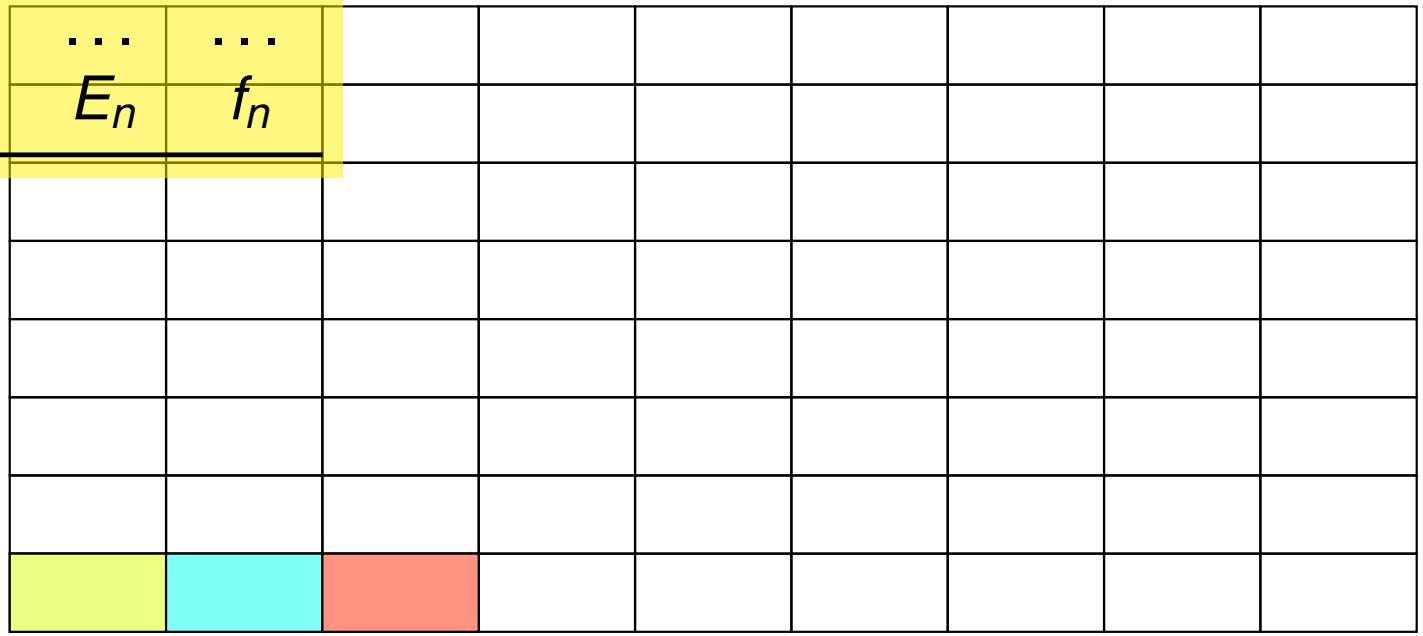

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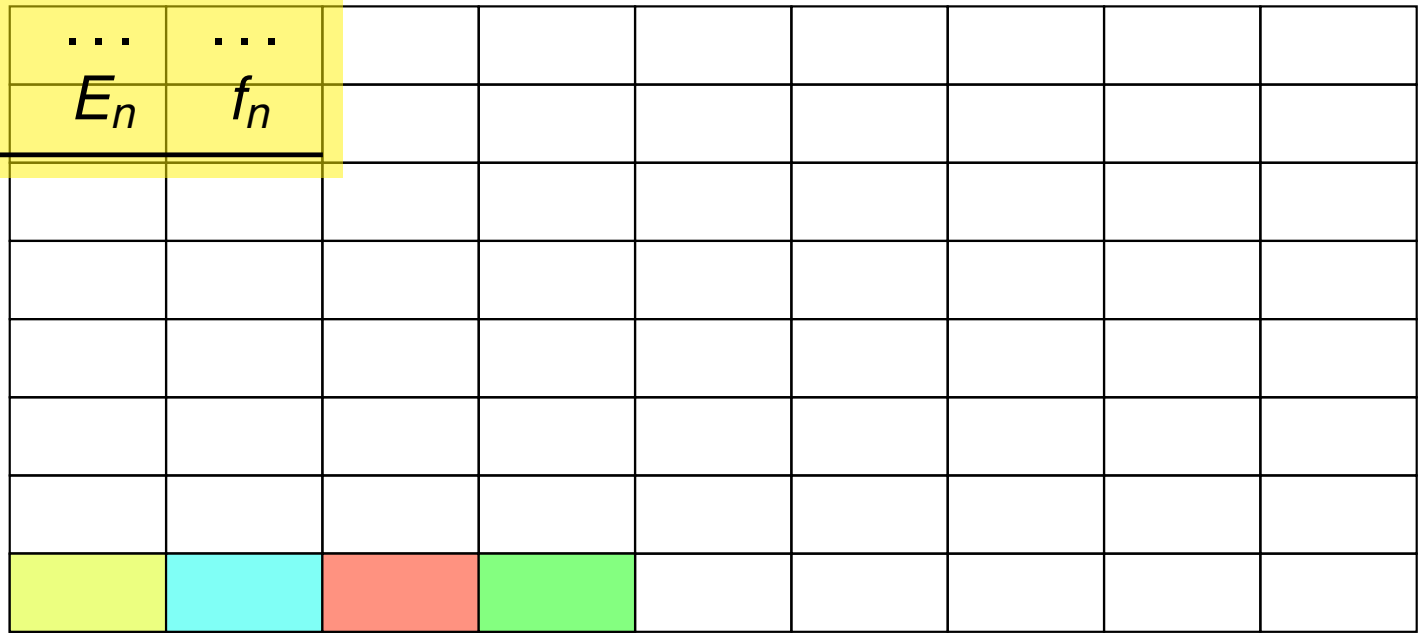

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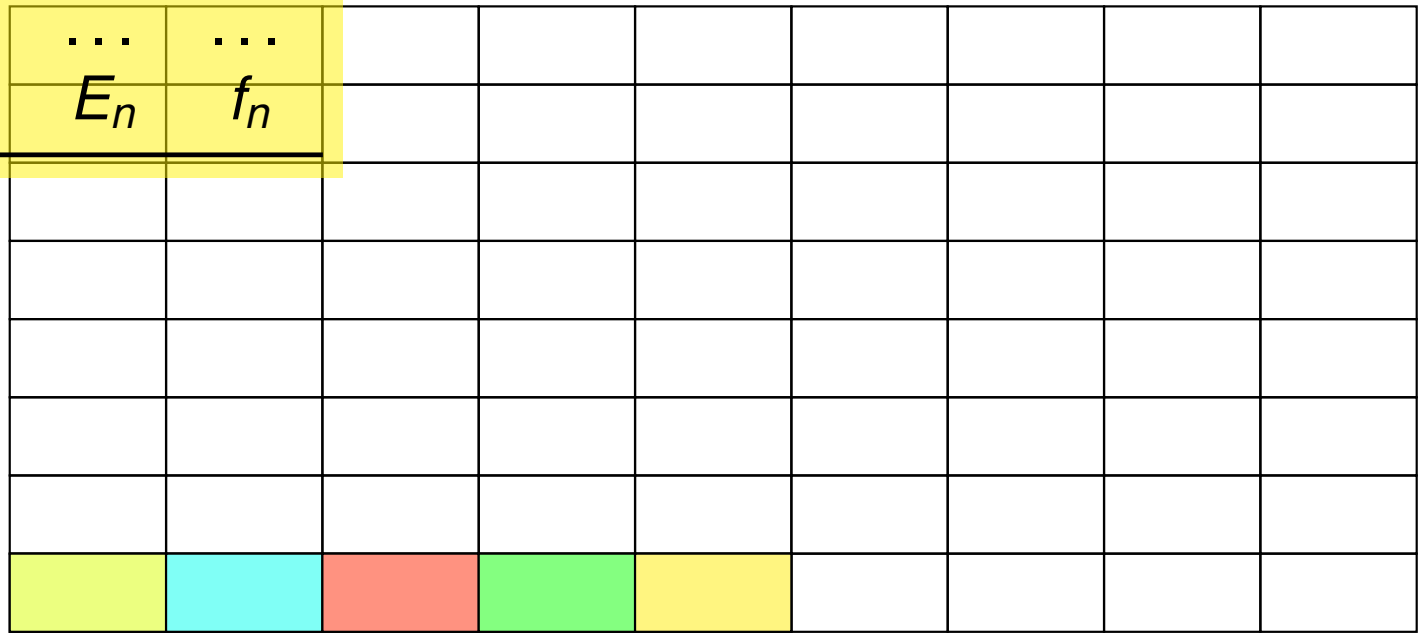

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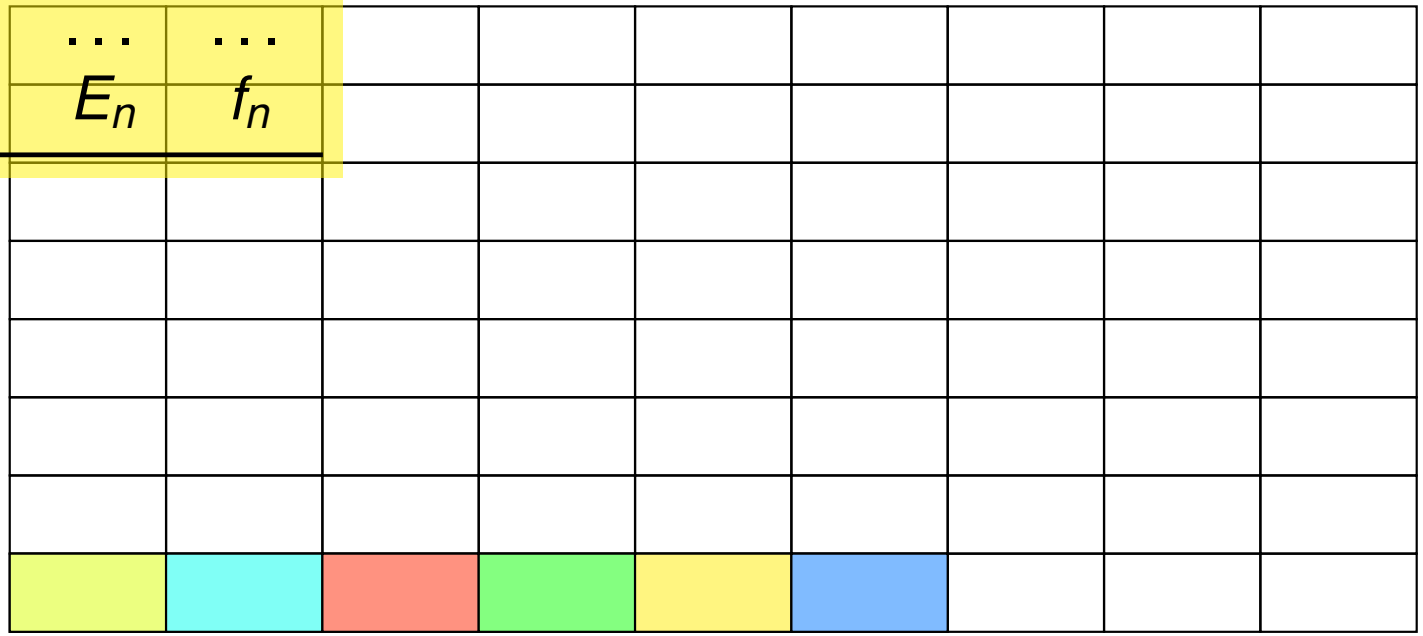

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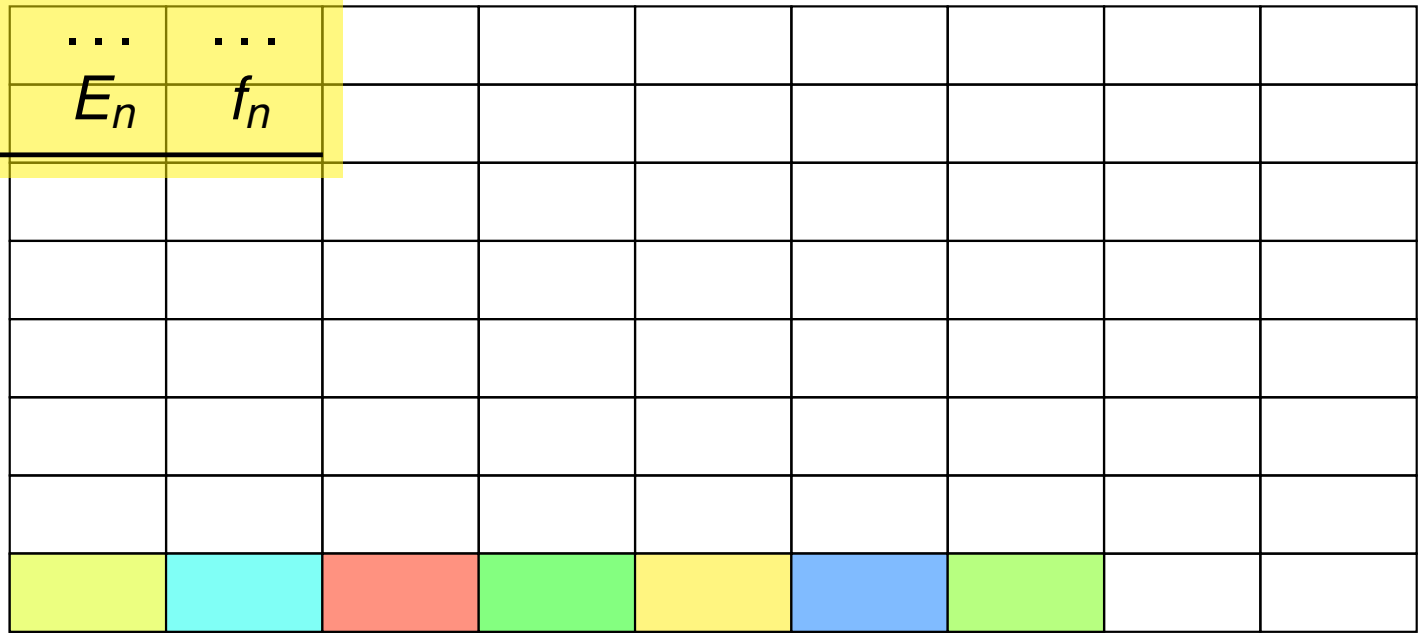

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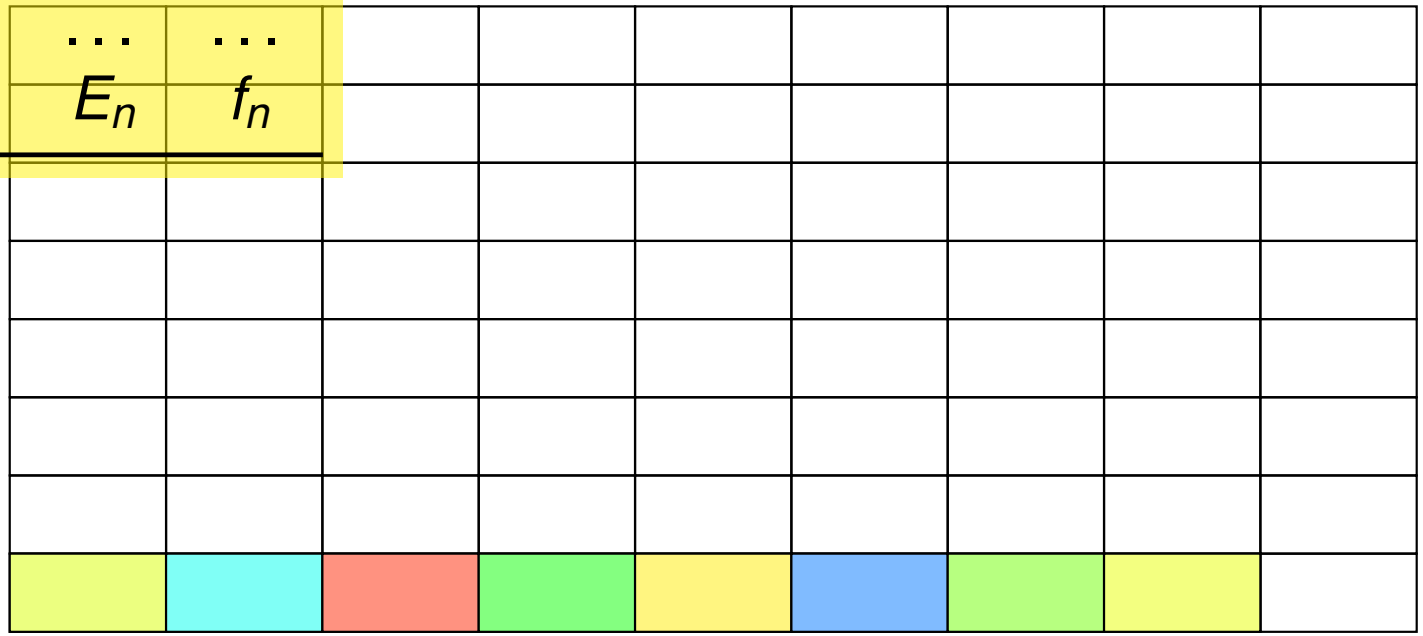

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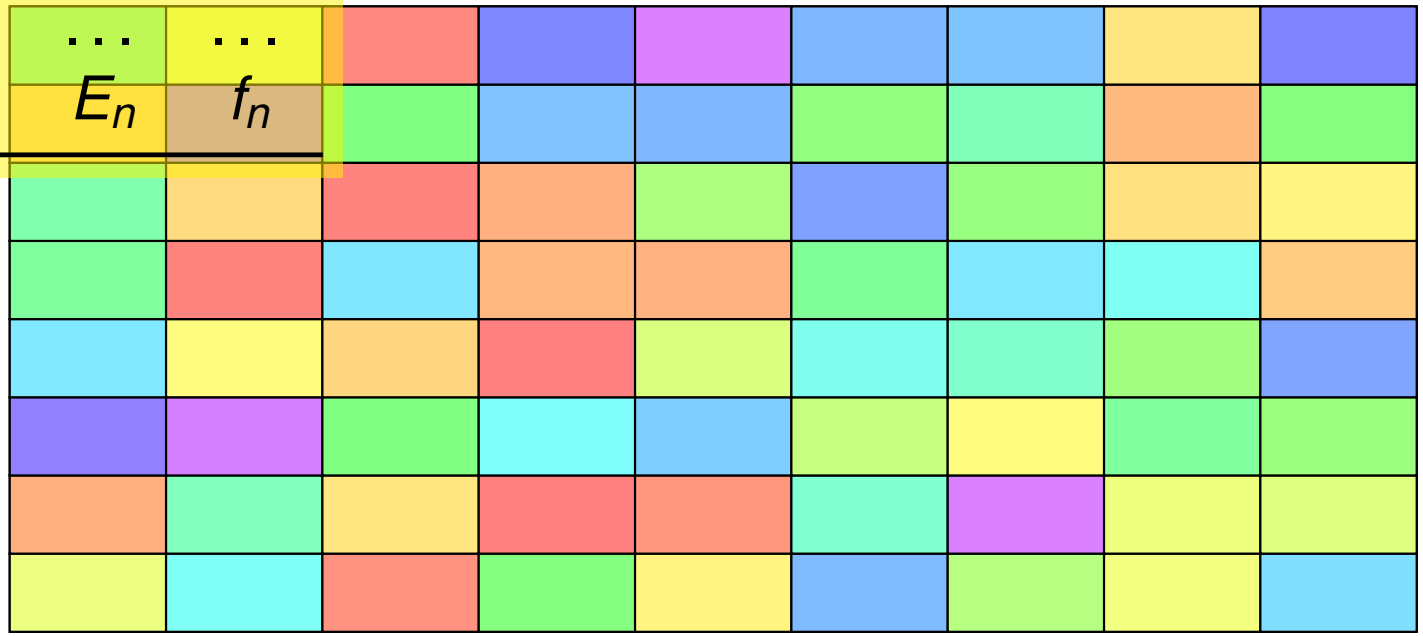

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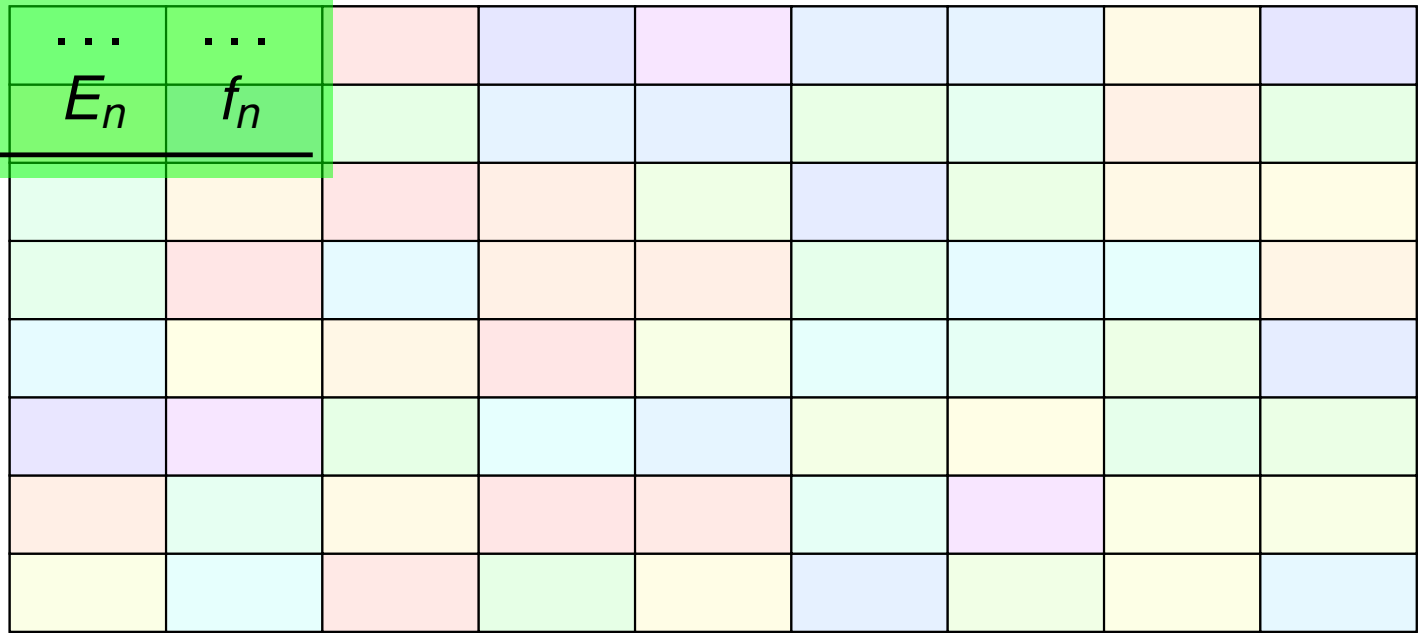
Finger joints



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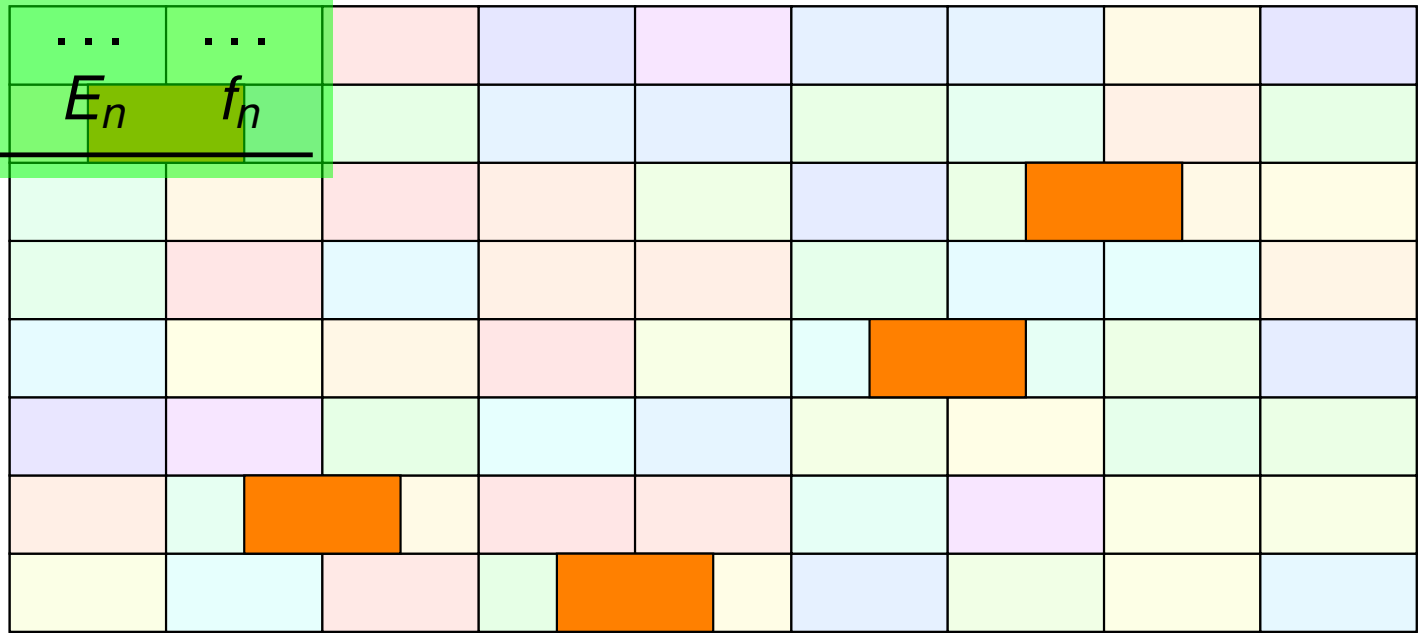

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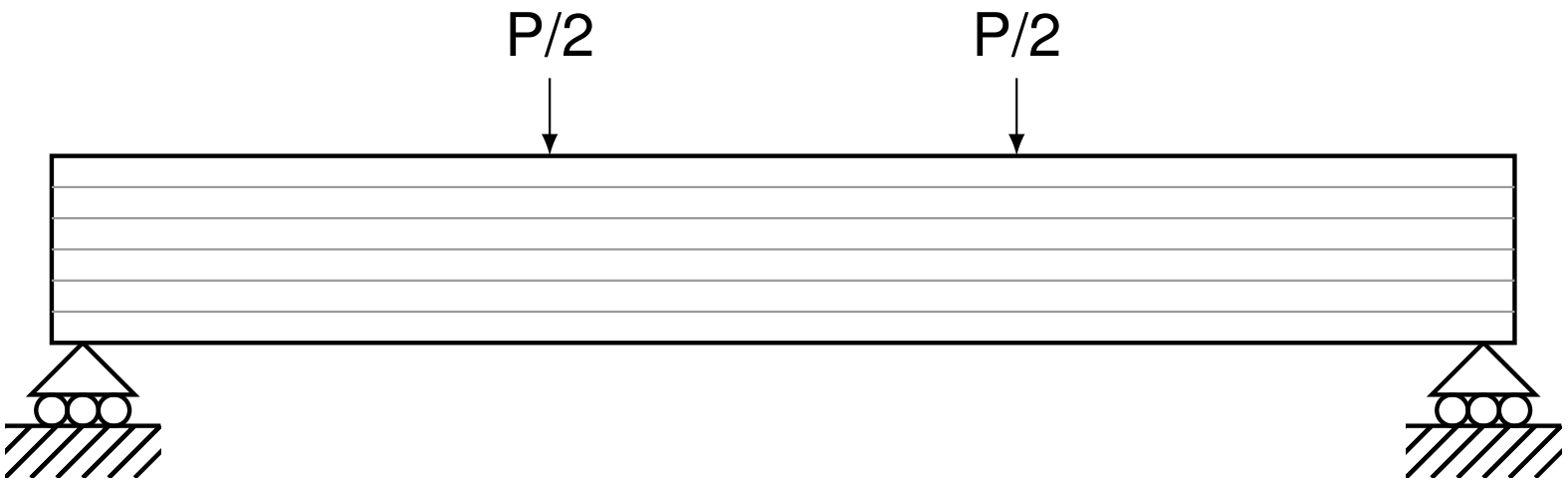

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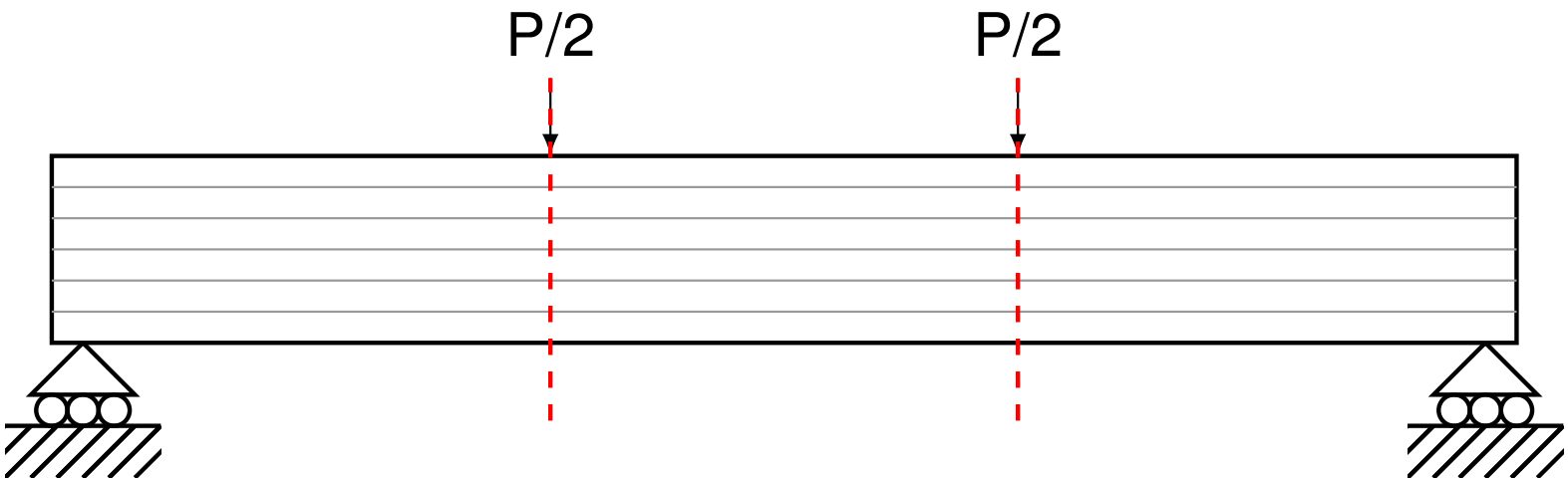

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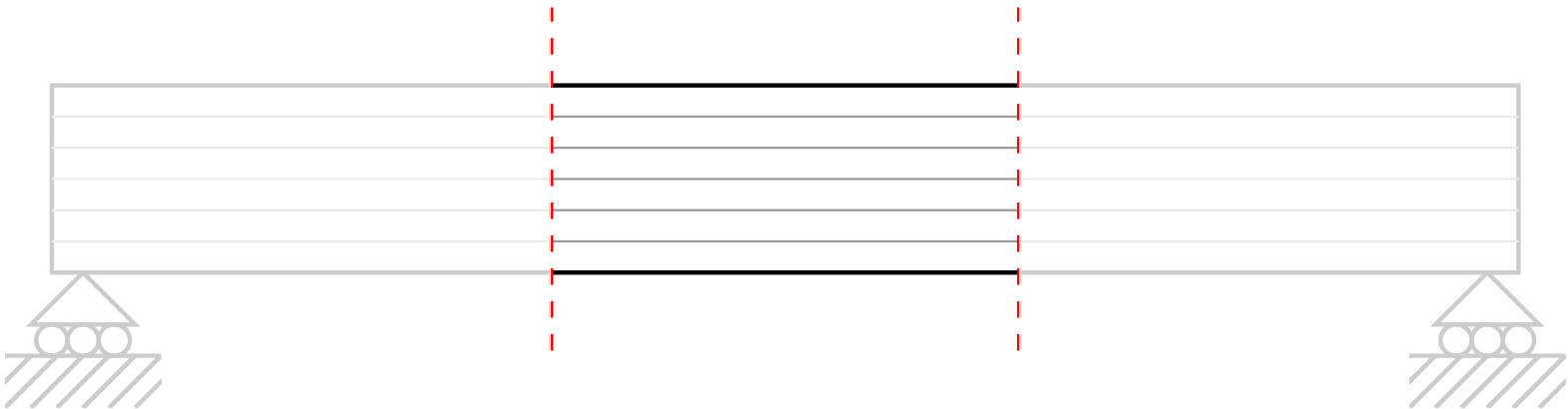

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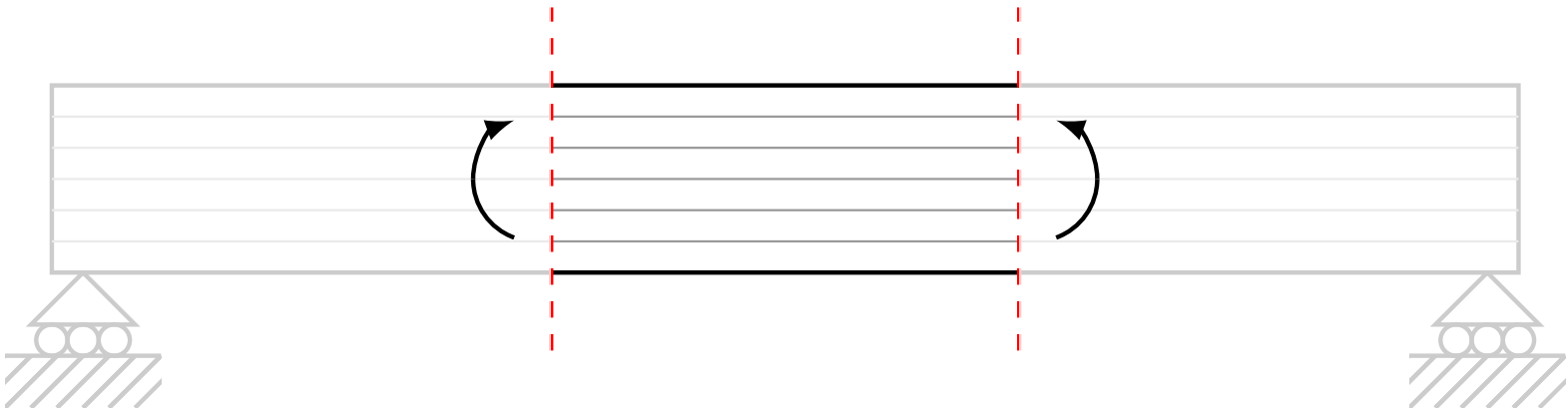

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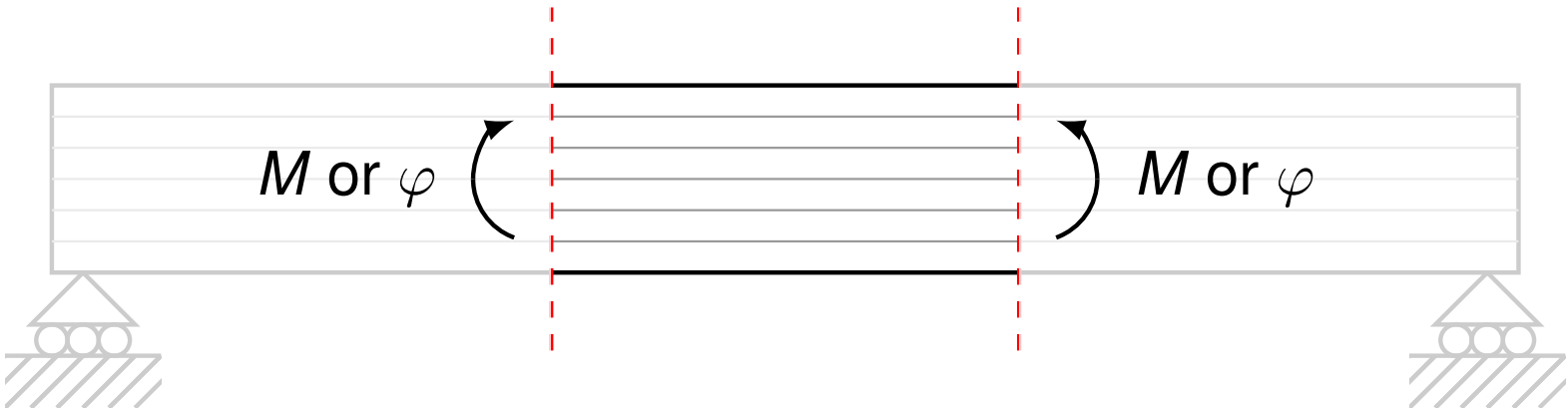

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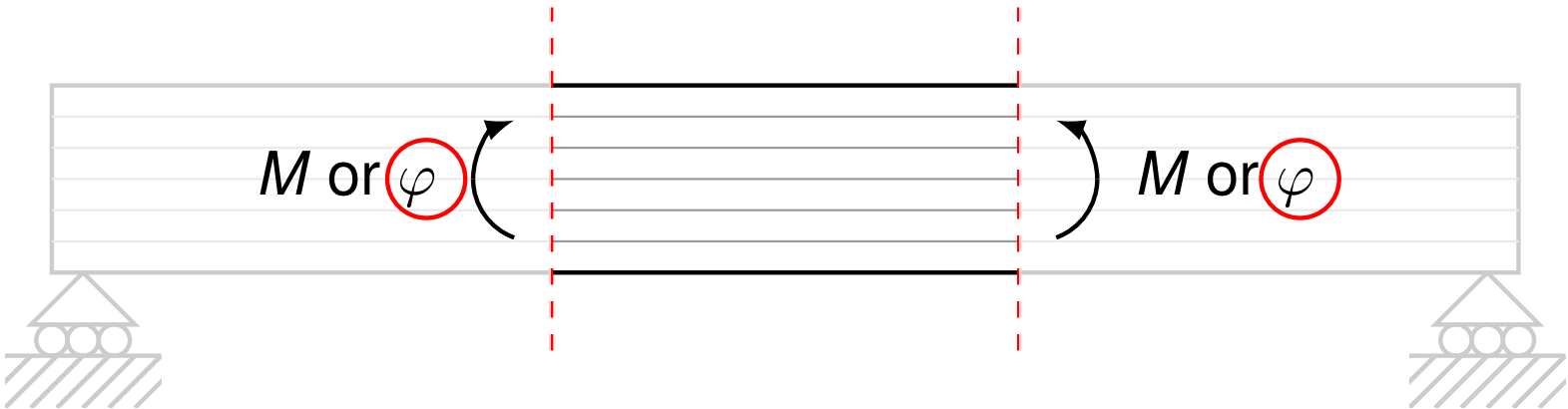

How does this look in Abaqus?

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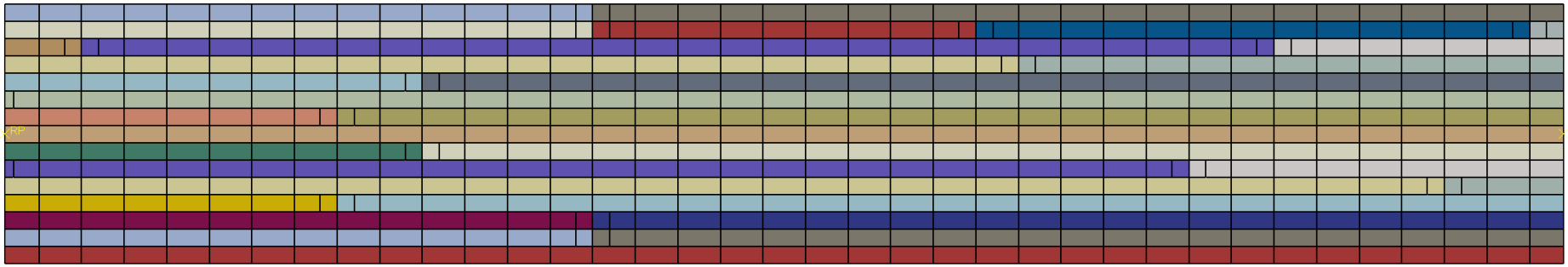
Boards



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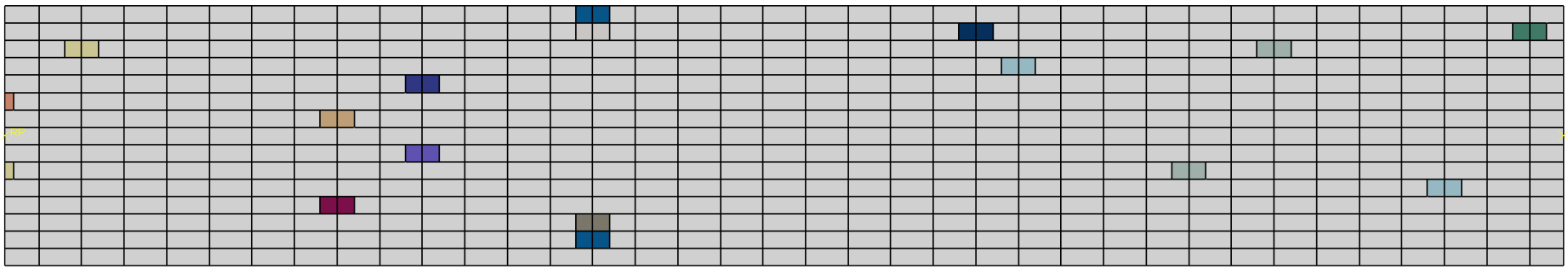
Finger joints



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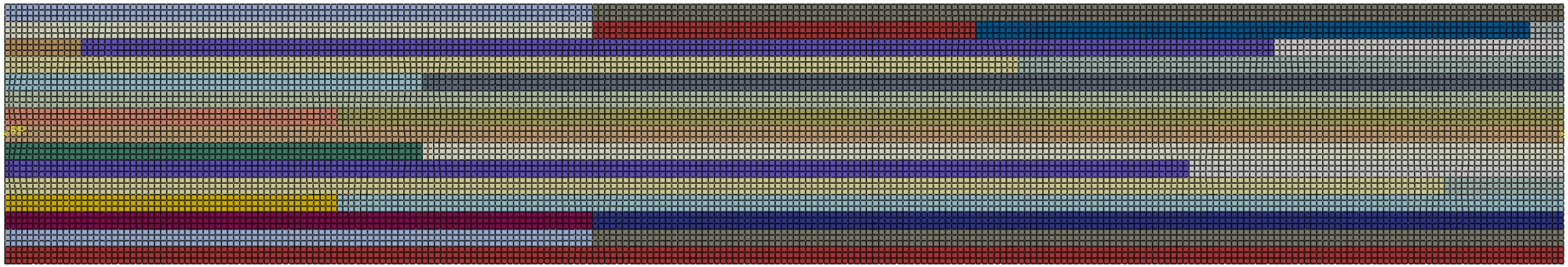
Meshing



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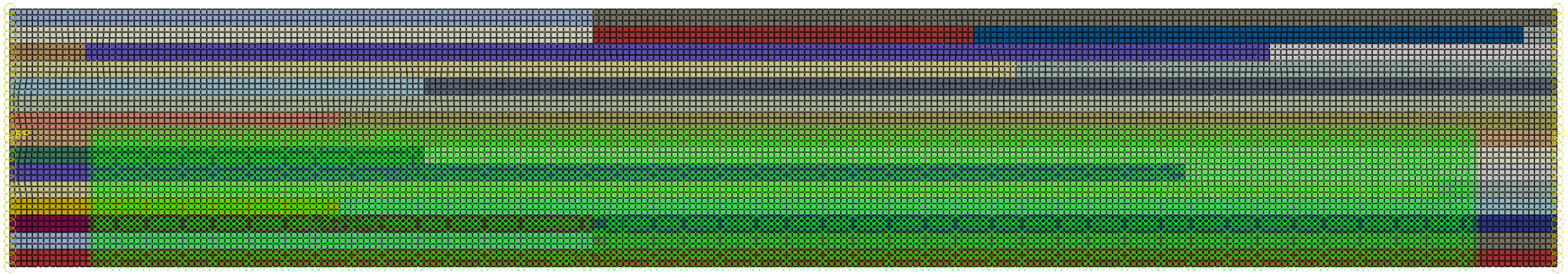
Enriched zone



Modeling the experiments realized at FCBA

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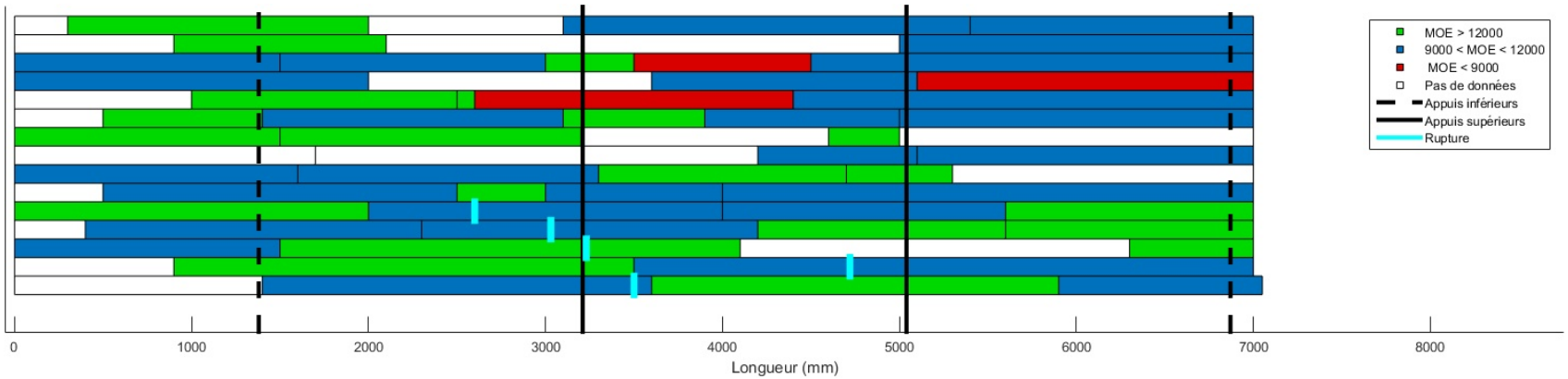
Modeling the experiments realized at FCBA

- Example: beam Nr. 9



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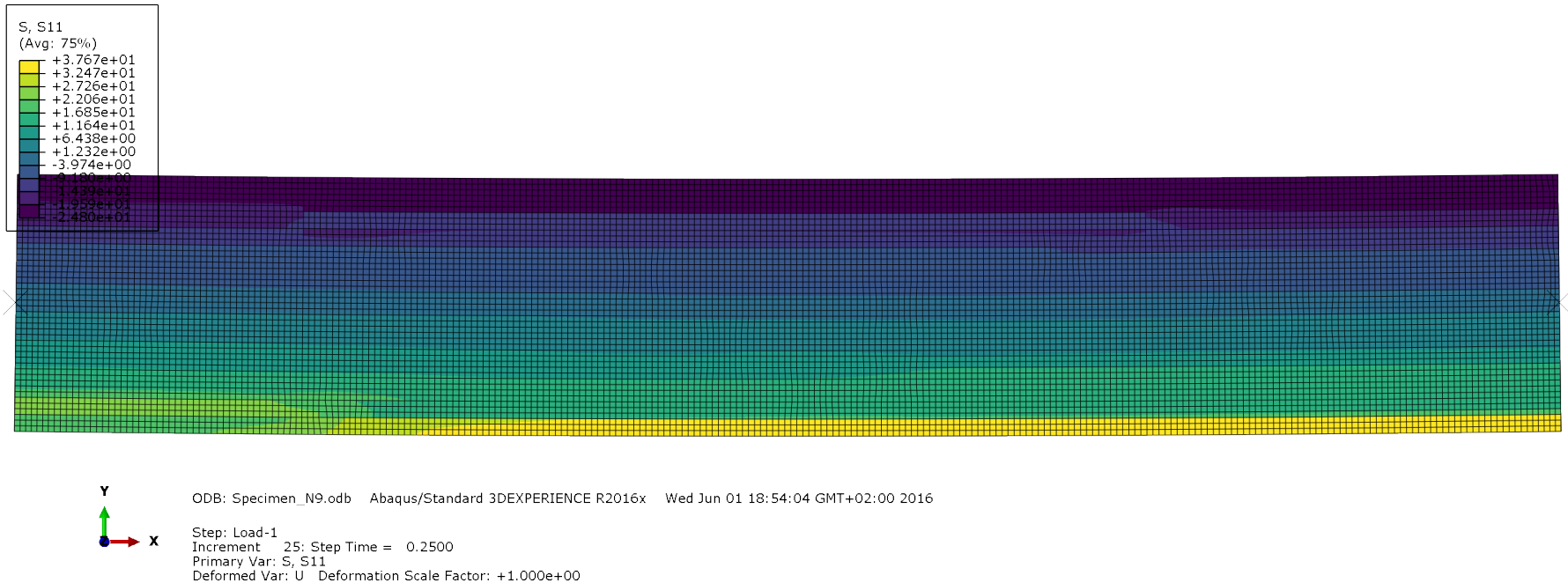
Beam Nr. 9



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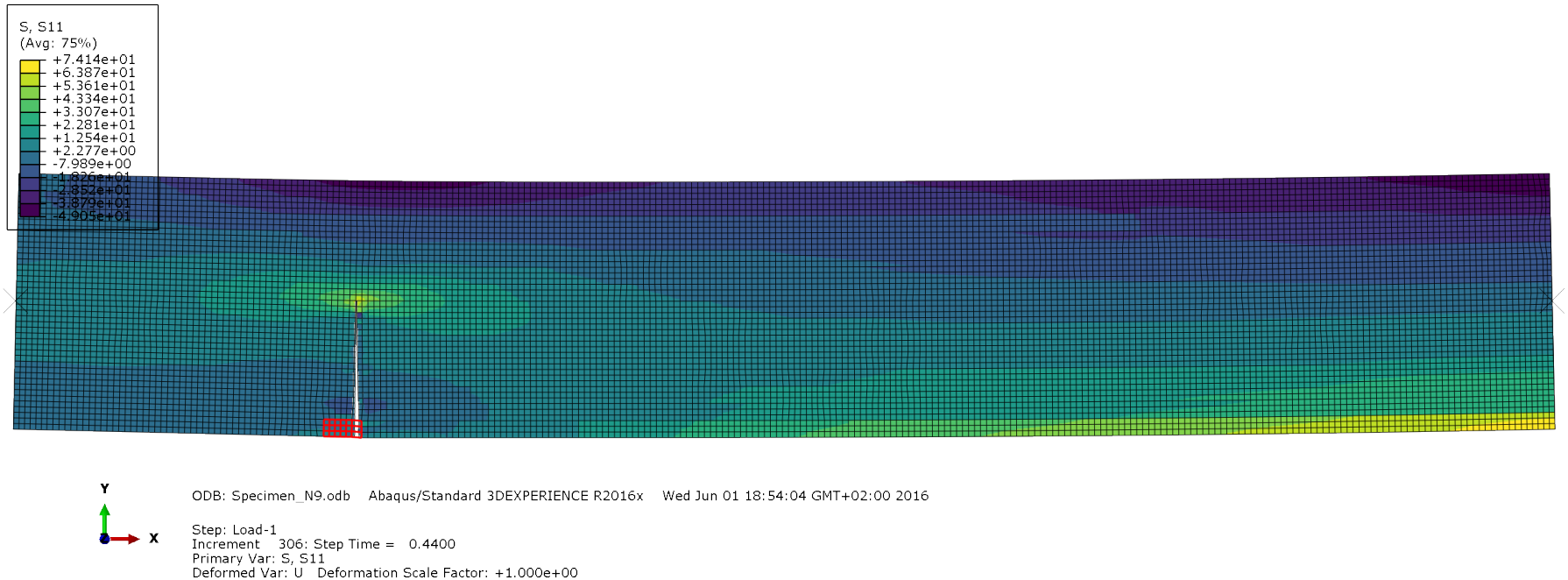

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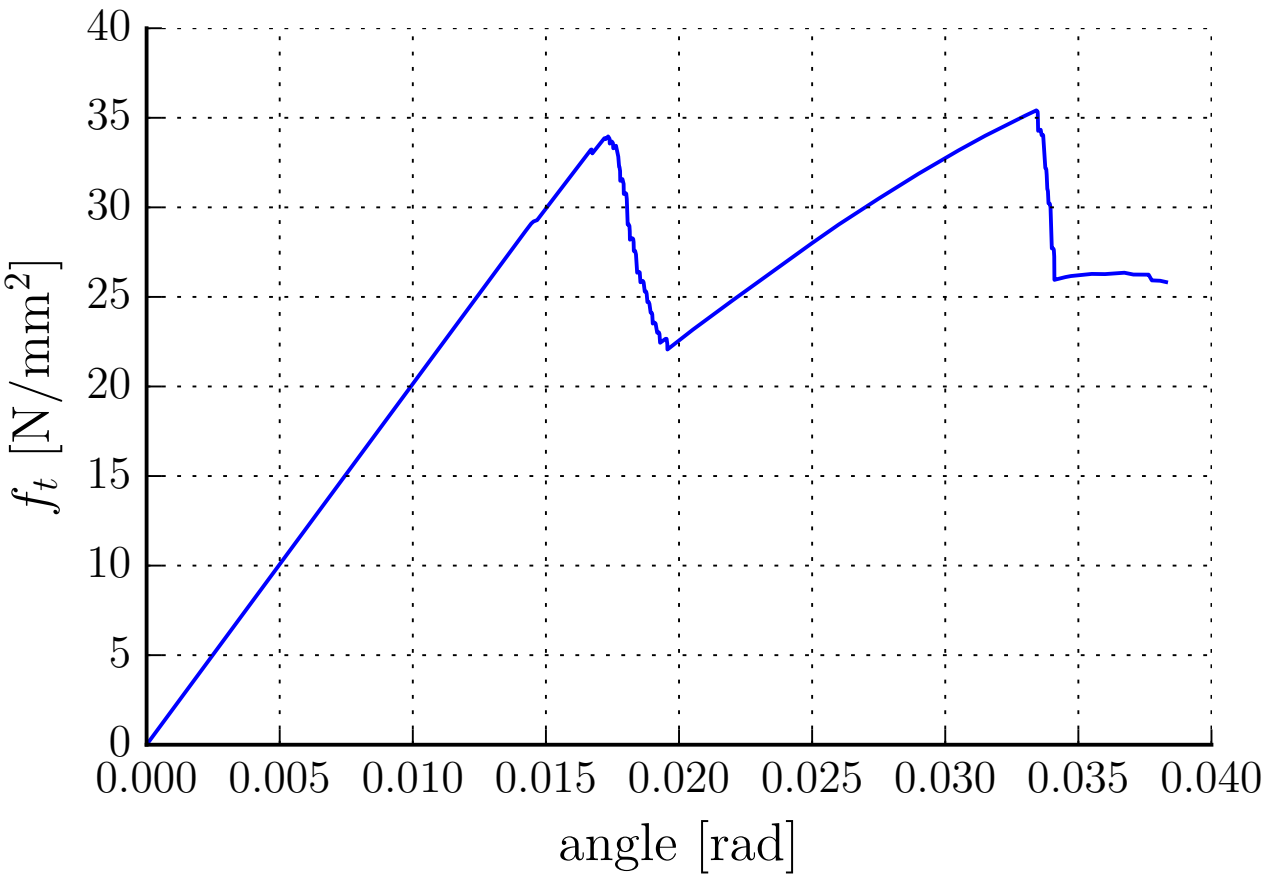

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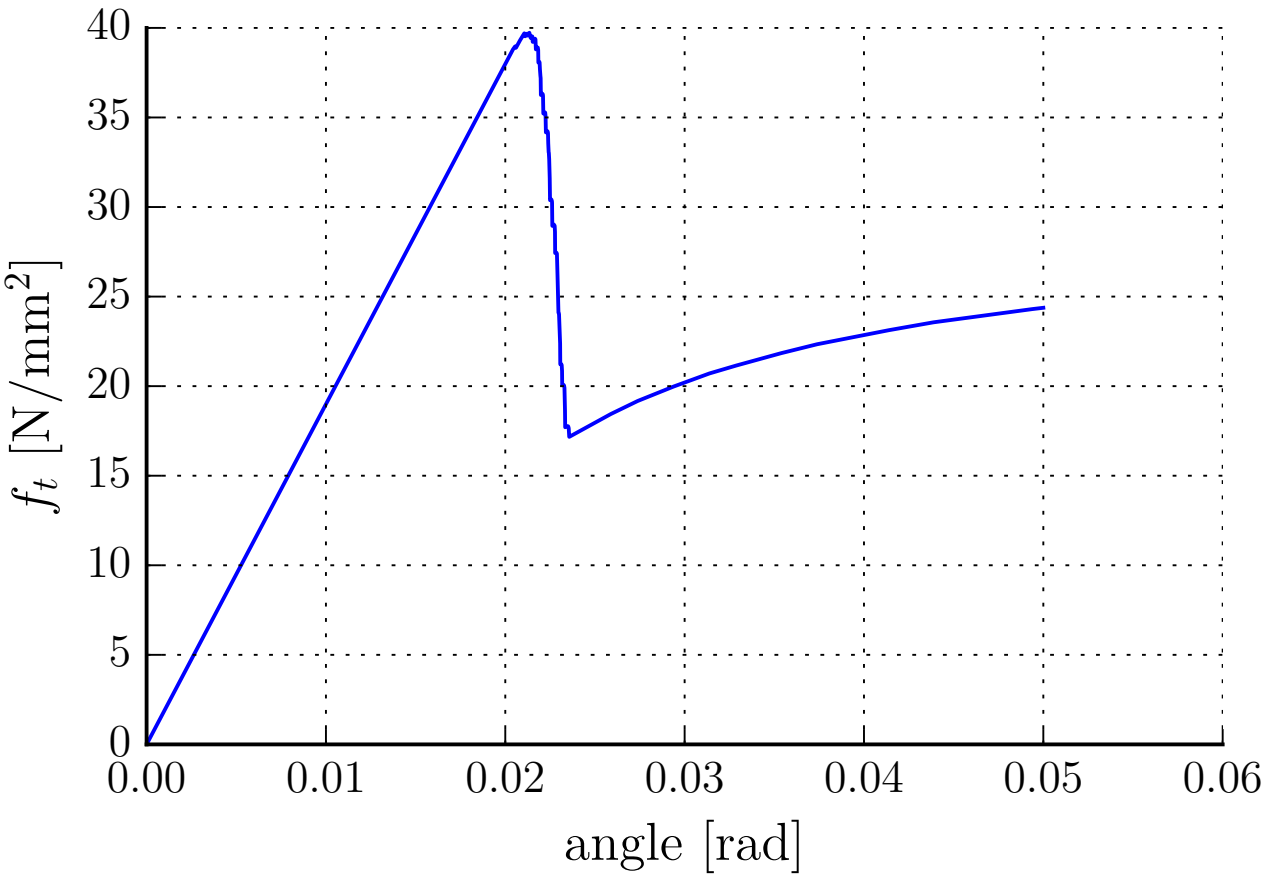

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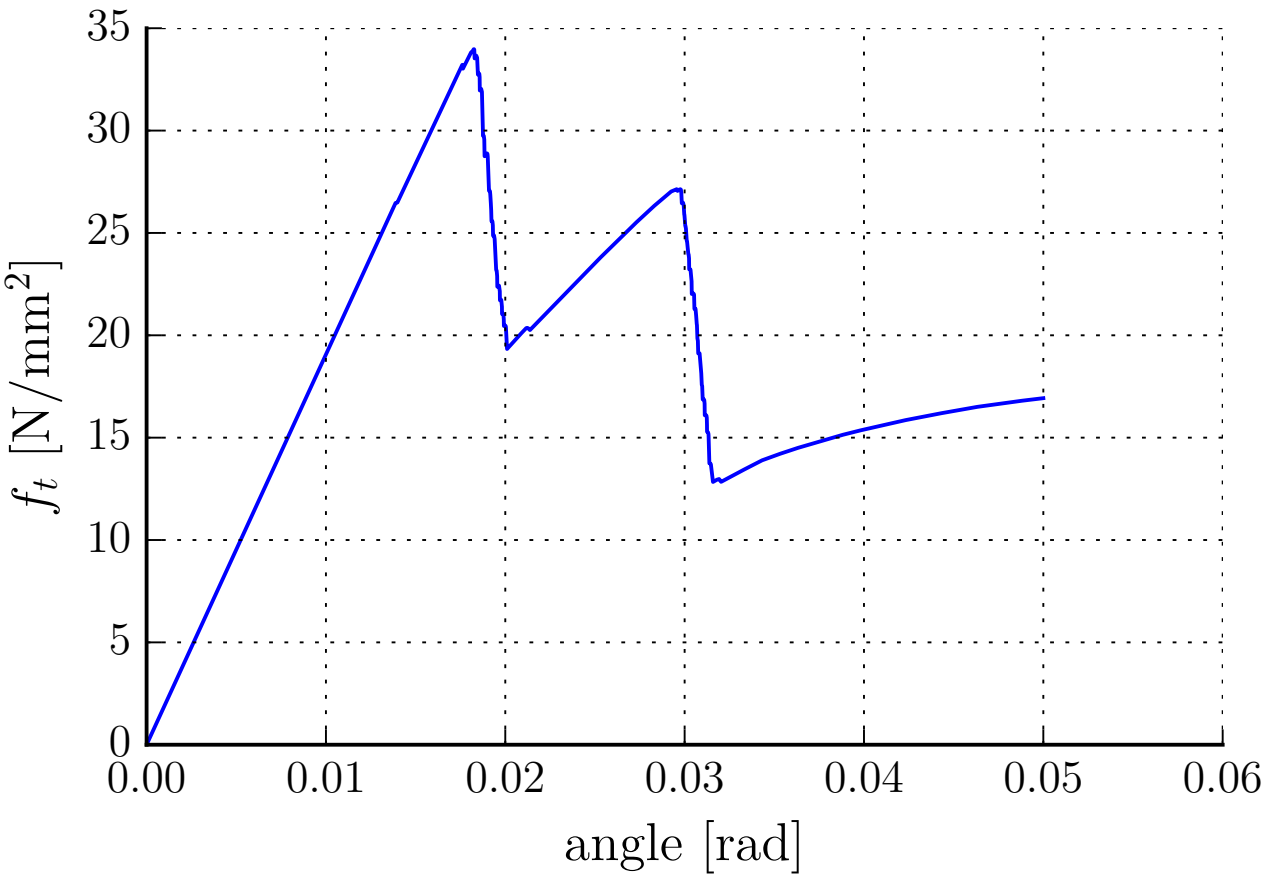

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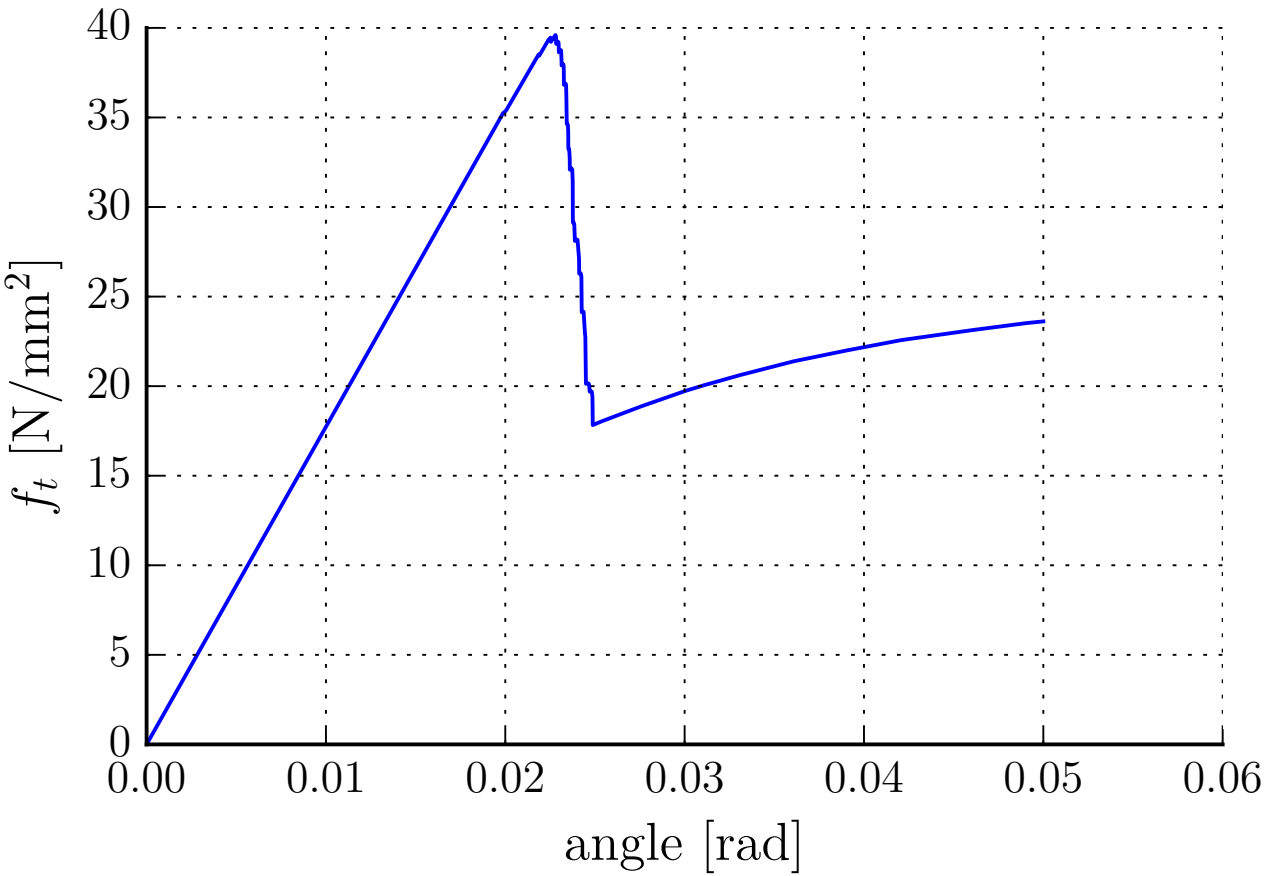

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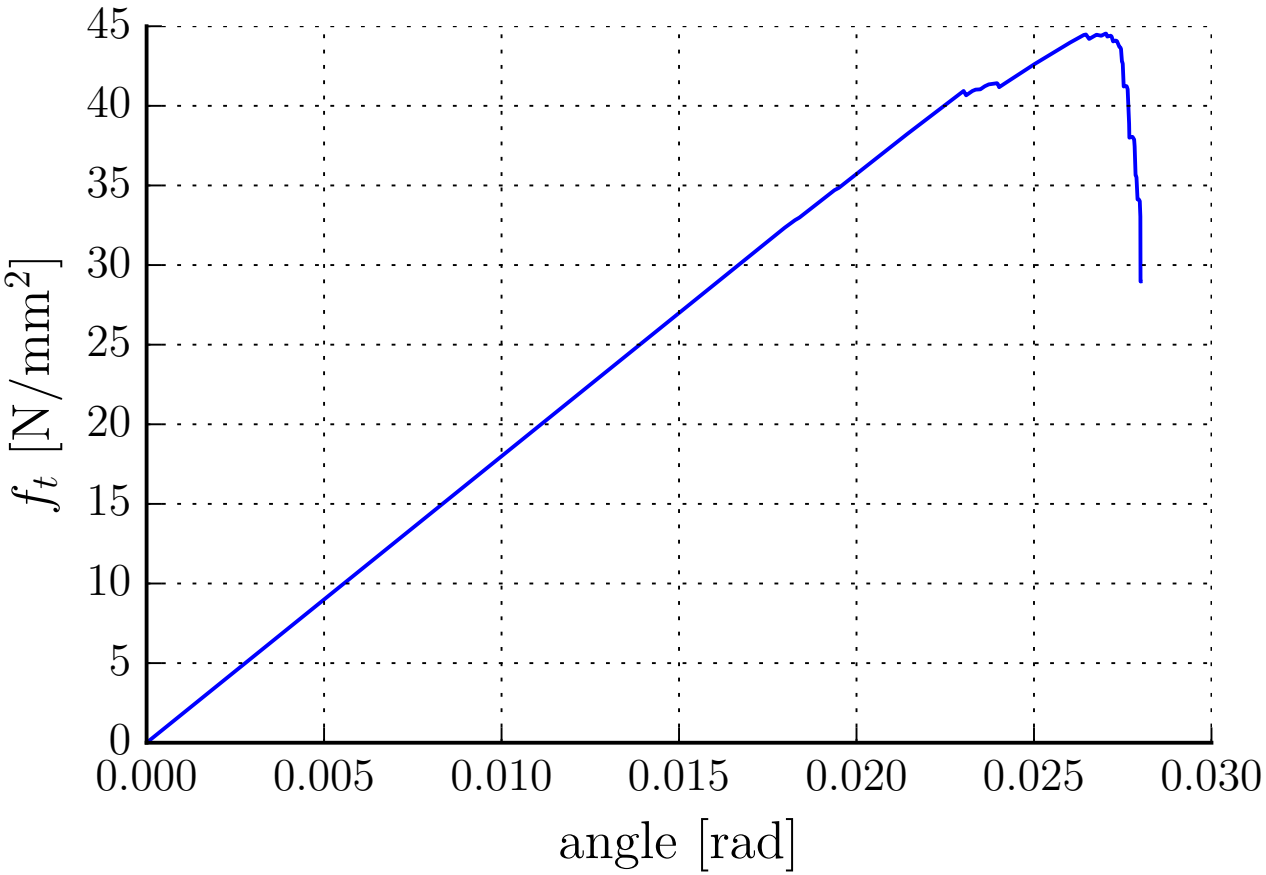

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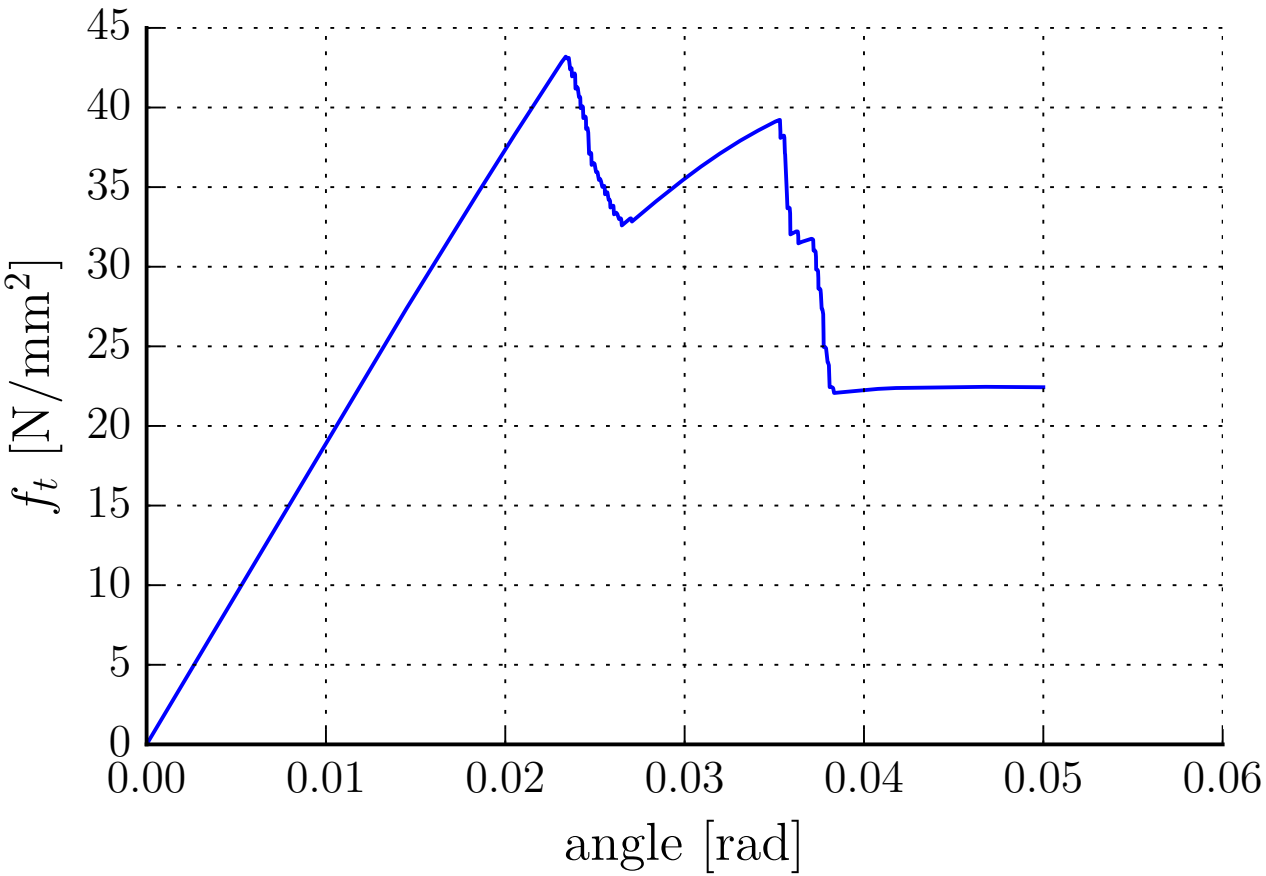

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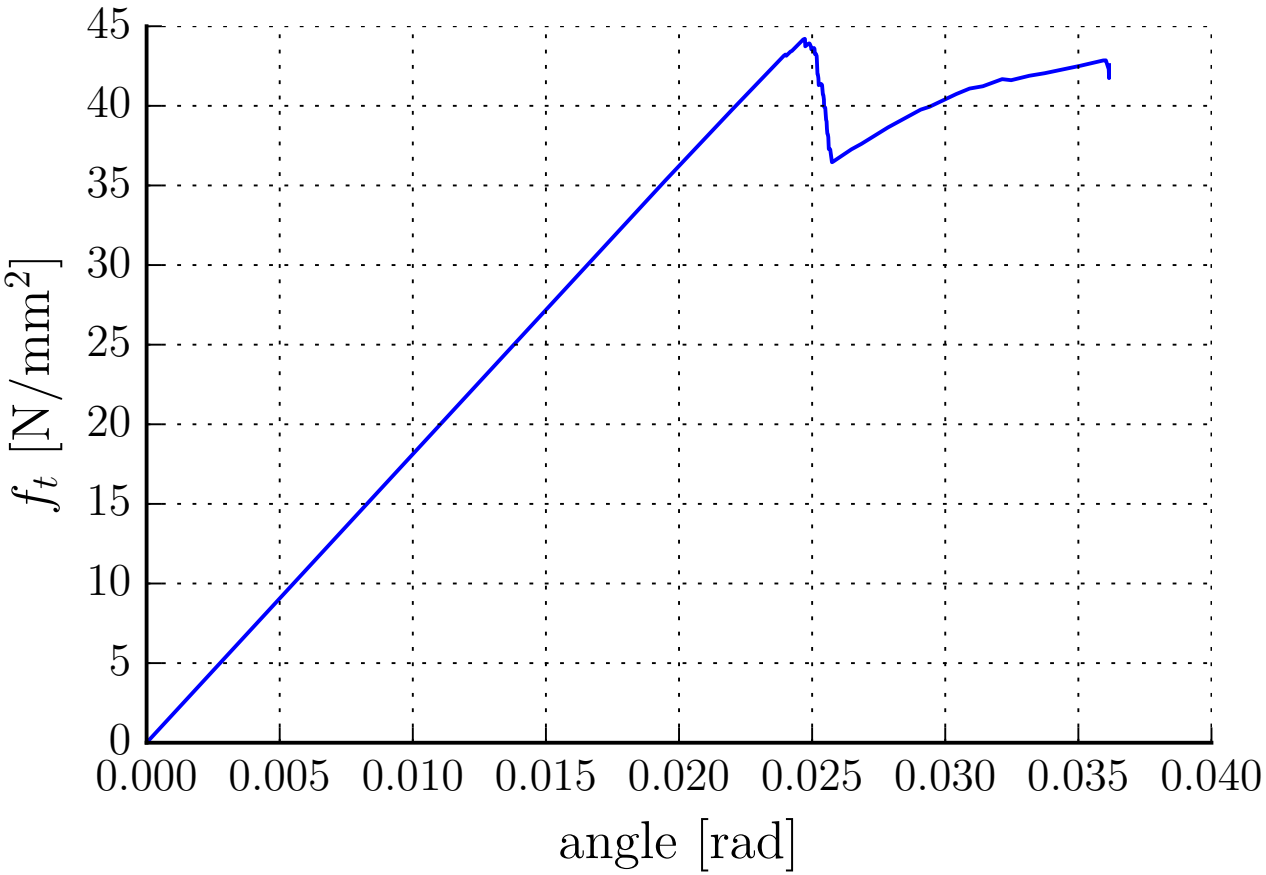

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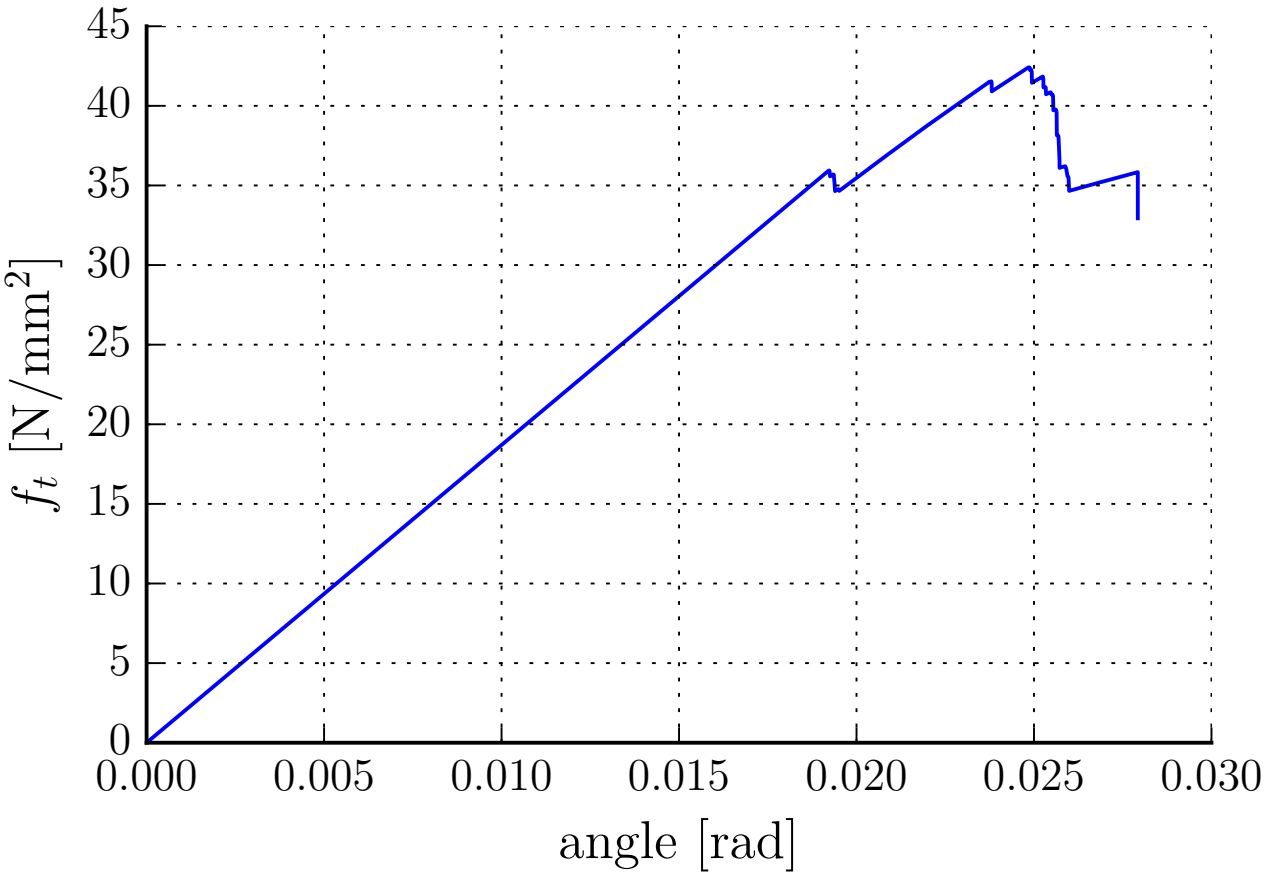

Overview of milestones

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	Milestone	Status
13.	Modeling of hardwood glulam	Both simulations models (analytical and FEM model) were developed. Verification of experimental testing is in progress. Current results show a good relation between theory and Experiments.
14.	Modeling of hybrid hardwood-softwood glulam	The model created for milestone 13 will be further developed to include the ability to model hybrid glulam composed of softwoods and hardwoods.

Thanks!